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VOL. III
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PROGRAM MANAGER
RMA CONTAMINATION CLEANUP

U.S. ARMY
MATERIEL COMMAND

— COMMITTED TO PROTECTION OF THE ENVIRONMENT —

COMPREHENSIVE MONITORING PROGRAM

Contract Number DAAA15-87-0095

FINAL SURFACE WATER DATA ASSESSMENT REPORT FOR 1989

JUNE 1990

Version 2.0

Volume III

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R.L. STOLLAR & ASSOCIATES, INC.

Harding Lawson Associates
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THE 1989 SURFACE WATER REPORT IS DIVIDED INTO SIX SECTIONS AND TWO APPENDICES. SECTION 1 PROVIDES A GENERAL HISTORICAL REVIEW OF THE DEVELOPMENT OF THE RMA. THE HISTORICAL ROLE OF SURFACE WATER FEATURES AT RMA, THE EFFECTS OF RMA INDUSTRIAL ACTIVITIES ON SURFACE SYSTEM MORPHOLOGY, AND THE MAJOR DRAINAGE BASINS THAT EXIST ON RMA ARE PRESENTED IN SECTION 2. SECTION 3 PROVIDE A DETAILED DISCUSSION OF THE PRESENT CMP PROGRAMS STRATEGIES AND METHODOLOGIES. SECTION 4 PRESENTS THE WATER QUALITY AND QUANTITY DATA COLLECTED DURING FISCAL YEAR 1989. SECTION 5 INTERPRETS THE COLLECTED SURFACE WATER DATA. SECTION 6 PROVIDES CONCLUSIONS AND A DETAILED SUMMARY OF FY89 RESULTS.
APPENDIX A INCLUDES INFORMATION RELATED TO SURFACE WATER QUANTITY AND APPENDIX B INCLUDES INFORMATION RELATED TO SURFACE WATER QUALITY.

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FINAL SURFACE WATER DATA ASSESSMENT REPORT FOR 1989

JUNE 1990

Version 2.0

Volume III

APPENDIX A

(Appendices A-1 to A-6)

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Prepared for:

U. S. ARMY PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL

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APPENDIX A

Surface-Water Quantity Data for Water Year 1989

APPENDIX A-1

Surface-Water Station Survey Information

APPENDIX A-1.1

Monitoring Station Survey Information

Appendix A-1.1 Table A-1.1-1 Monitoring Station Survey Information

Station #	Location	Northing	Easting	Elevation/GH
SW01001	N. Uvalda Interceptor	175,588.02	2,187,896.41	5,260.55 = TBM 5,258.92 = 3.33 on SG
SW01003	South Plants Ditch	177,784.84	2,185,793.81	5,255.61 = TBM 5,248.78 = 0.00 on SG 5,253.13 = PZF on SW Weir 5,252.21 = PZF on S Weir
SW01004	Upper Derby Lake	176,932.23	2,187,034.25	5,247.77 = 0.00 on SG
SW01005	Lower Derby Lake	176,414.44	2,183,945.48	5,230.17 = 0.00 on SG
SW02001	Ladora Weir	176,311.48	2,183,662.77	5,235.49 = TBM 5,228.84 = 0.00 on SG
SW02003	Ladora Lake	177,726.61	2,179,691.86	5,222.11 = 15.00 on SG
SW02004	Lake Mary	177,378.84	2,178,434.27	5,202.39 = 0.00 on SG
SW05001	South First Creek (old)	175,590.08	2,197,131.85	5,281.87 = TBM 5,278.58 = 0.00 on SG 5,278.91 = PZF
SW08003	South First Creek (new)	173,686.65	2,198,520.22	5,293.84 = TBM A 5,293.94 = TBM B 5,290.83 = PZF 5,290.82 = 0.00 on SG
SW11001	Peoria Interceptor	170,287.71	2,179,583.49	5,252.48 = TBM 5,250.28 = 3.33 on SG
SW11002	Havana Interceptor	170,992.86	2,178,854.75	5,261.49 = TBM 5,252.09 = 0.00 on SG
SW11003	Havana Pond	172,696.42	2,180,121.78	5,253.97 = TBM 5,244.08 = 0.00 on SG
SW12005	South Uvalda Interceptor	170,445.36	2,186,746.06	5,272.37 = TBM 5,274.40 = 3.33 on SG
SW12007	Highline Lateral	175,292.77	2,188,725.83	5,275.15 = TBM 5,275.10 = 3.33 on SG 5,272.63 = PZF
SW24001	Sewage Treatment Effluent	194,147.34	2,186,376.17	5,154.56 = PVC

Appendix A-1.1 Table A-1.1-1 (cont'd.)

Station #	Location	Northing	Easting	Elevation/GH
SW24002	N. First Creek (new)	195,311.93	2,187,575.26	5,146.52 = TBM A 5,146.01 = TBM B 5,141.75 = PZF 5,144.51 = 3.33 on SG
SW36001	Basin A	180,985.85	2,184,525.97	5,253.51 = TBM A 5,253.50 = TBM B 5,252.11 = 0.00 on SG 5,252.19 = PZF
SW37001	First Creek Off-post	199,013.30	2,180,816.71	5,108.99 = TBM 5,110.24 = 3.33 on SG 5107.43 = PZF Weir

SG = Staff Gage
TBM = Temporary Bench Mark
PZF = Point of Zero Flow

APPENDIX A-1.2

Station Survey Information

APPENDIX A-1.2

Cross-Section Survey Plots

Cross Sections were surveyed at the following stations:

North Uvalda (SW01001)
Peoria Interceptor (SW11001)
Havana Interceptor (SW11002)
South Uvalda (SW12005)
North First Creek (SW24002)

Two channel cross sections were surveyed below the structure, one cross section through the center of the structure, one cross section upstream of the structure through the existing staff gage and two additional cross sections were surveyed upstream of the staff gage. The maximumdistance between adjacent cross sections was five channel widths.

One cross section was surveyed at Havana Interceptor along with upstream and downstream thalweg elevations for bed slope calculations. Four cross sections were surveyed at North Uvalda. Six cross sections were surveyed at Peoria Interceptor and South Uvalda. A total of five cross sections well surveyed at North First Creek.

Each cross seciton elevation is in feet mean sea level (MSL) and is tied to a vertical control (temporary bench mark - TBM) near each gage. All cross sections were surveyed from left bank to right bank looking in a downstream direction. Horizontal and vertical scales for plotting were selected independently for each station reach based on best visual representation of plots to actual site conditions. Cross-section plot number three and four for each station includes the staff gage elevations on the cross-section plot. .

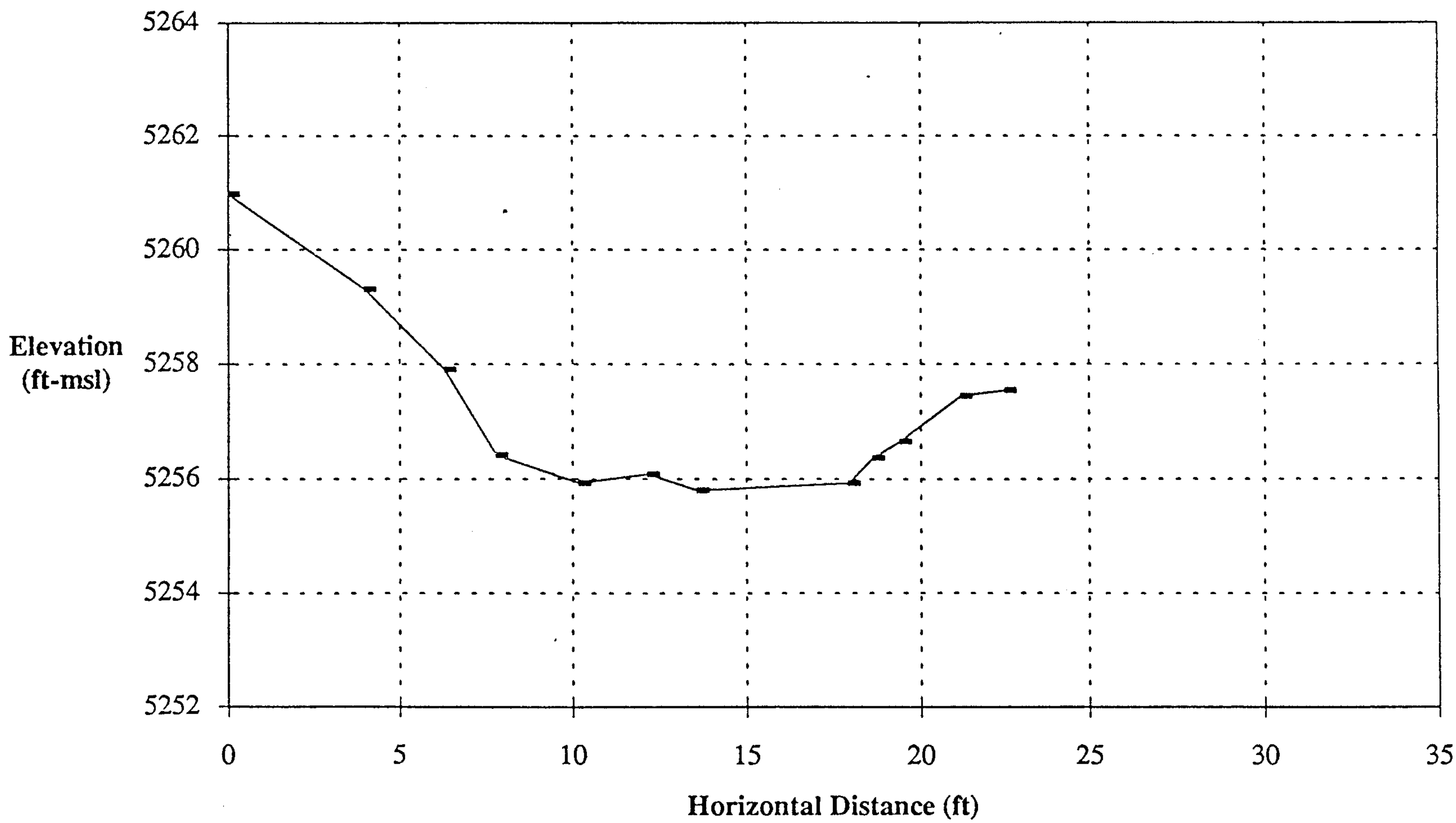
Plan view drawings were produced for each surveyed station. The plan views contain the following information:

Distance between cross secitons.
Location of the control structure.
Location of the stilling well.
Location of the staff gage.
Location of the TBM.
Direction of flow.
Average width of the channel.

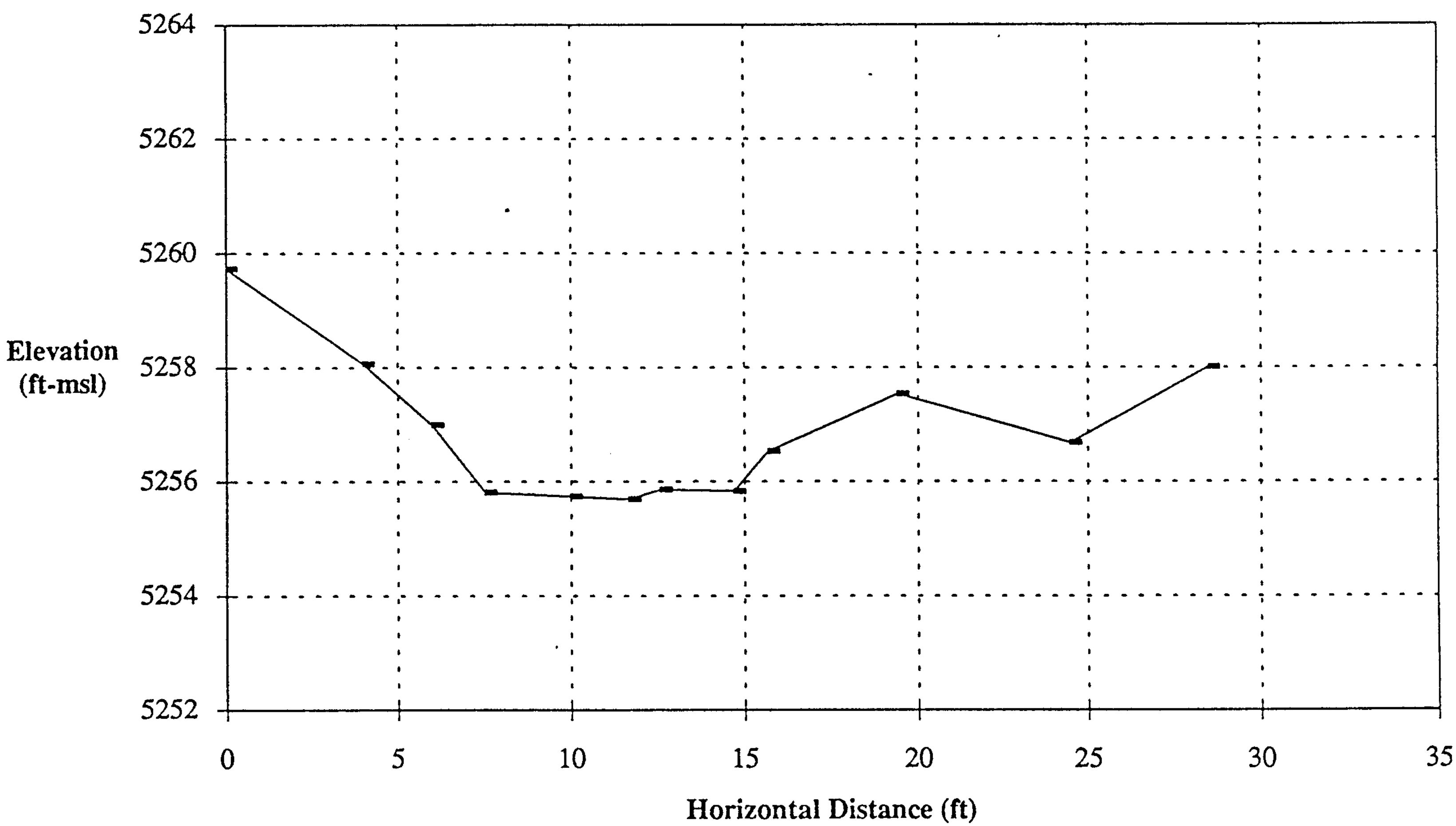
APPENDIX A-1.2.1

Cross Section Survey Plots

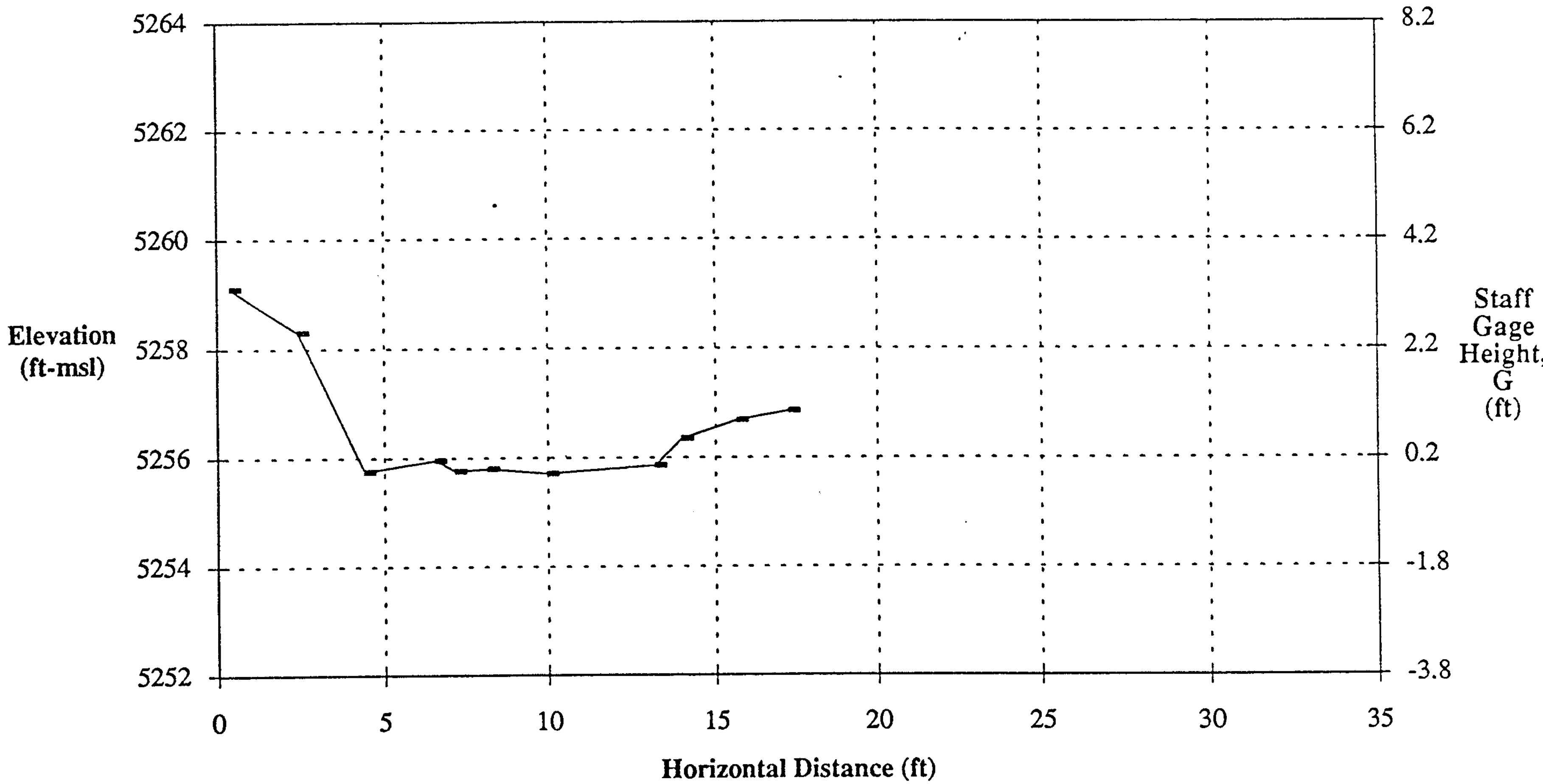
NORTH UVALDA (STATION SW01001)
CROSS SECTION 1



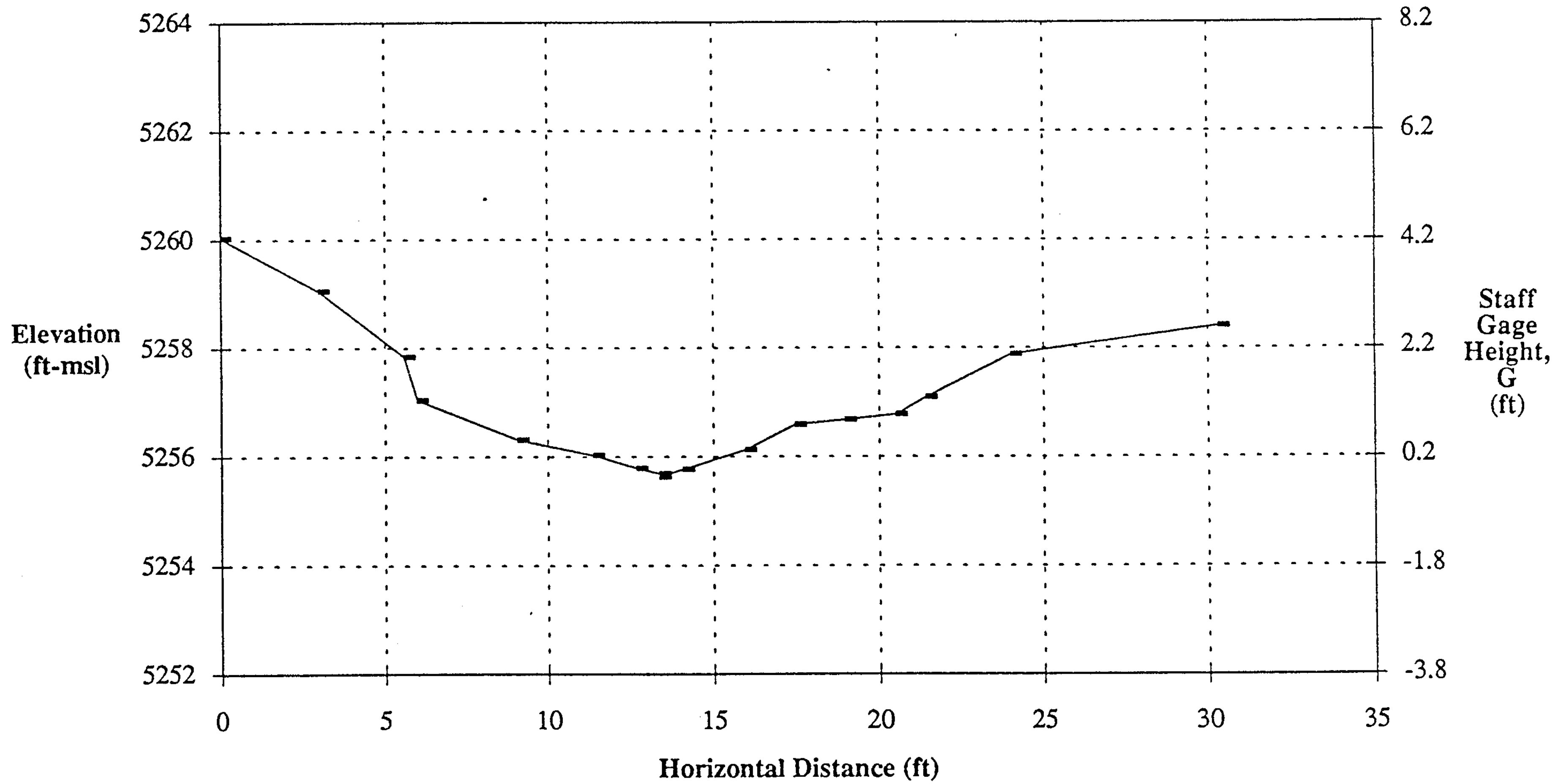
NORTH UVALDA (STATION SW01001)
CROSS SECTION 2



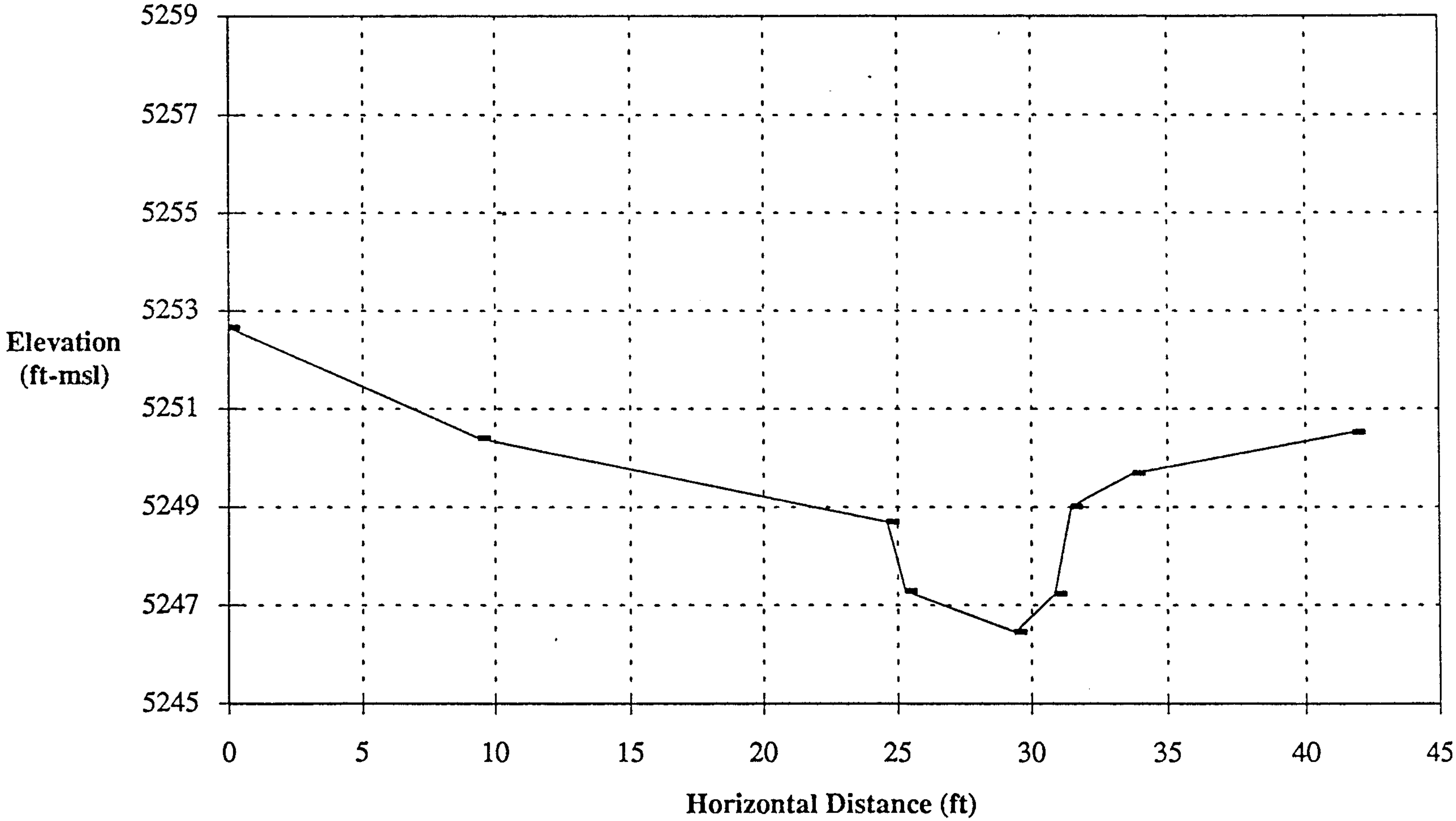
NORTH UVALDA (STATION SW01001)
CROSS SECTION 3



NORTH UVALDA (STATION SW01001)
CROSS SECTION 4



PEORIA INTERCEPTOR (STATION SW11001)
CROSS SECTION 1



PEORIA INTERCEPTOR (STATION SW11001)
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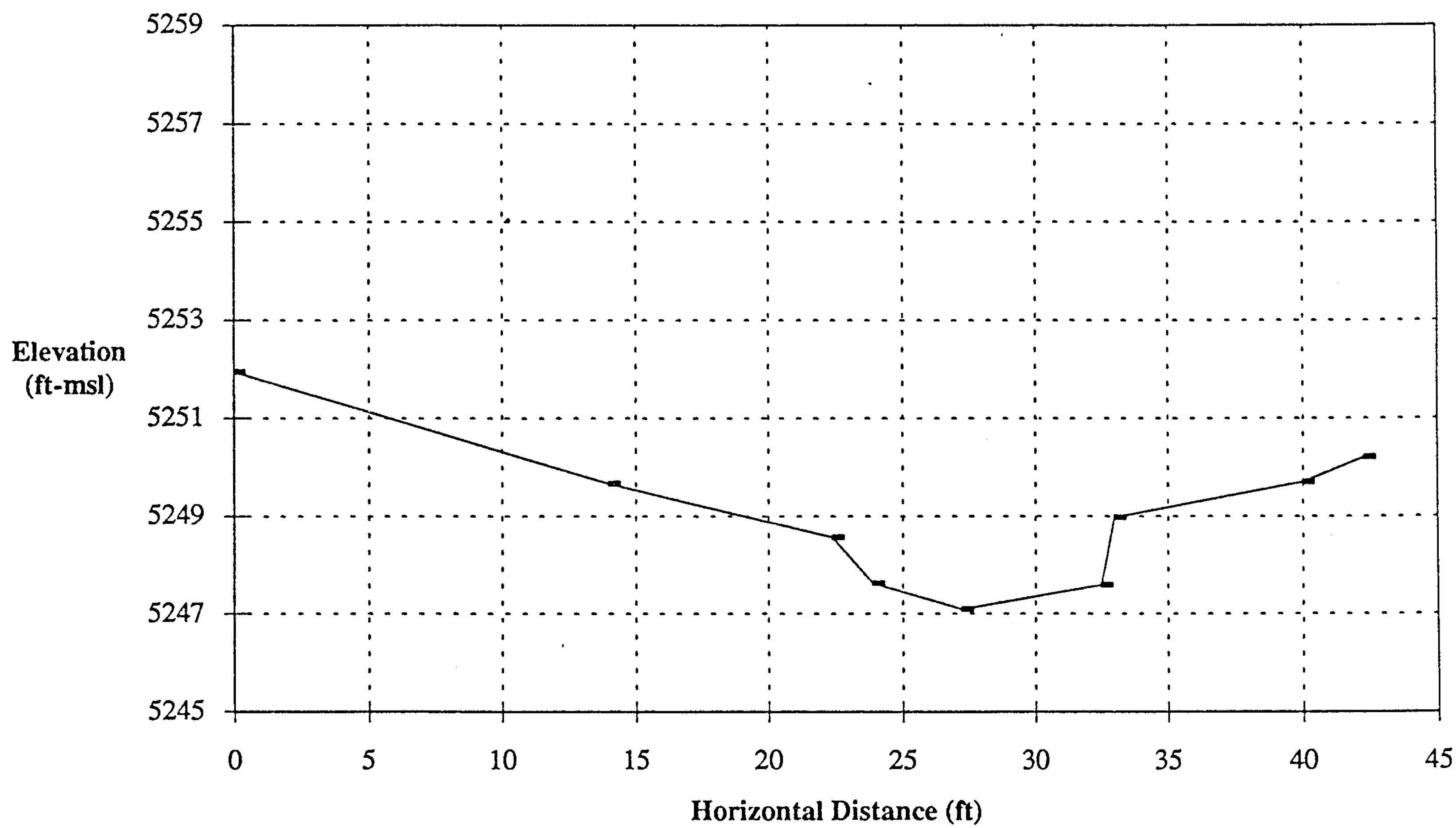

PEORIA INTERCEPTOR (STATION SW11001)
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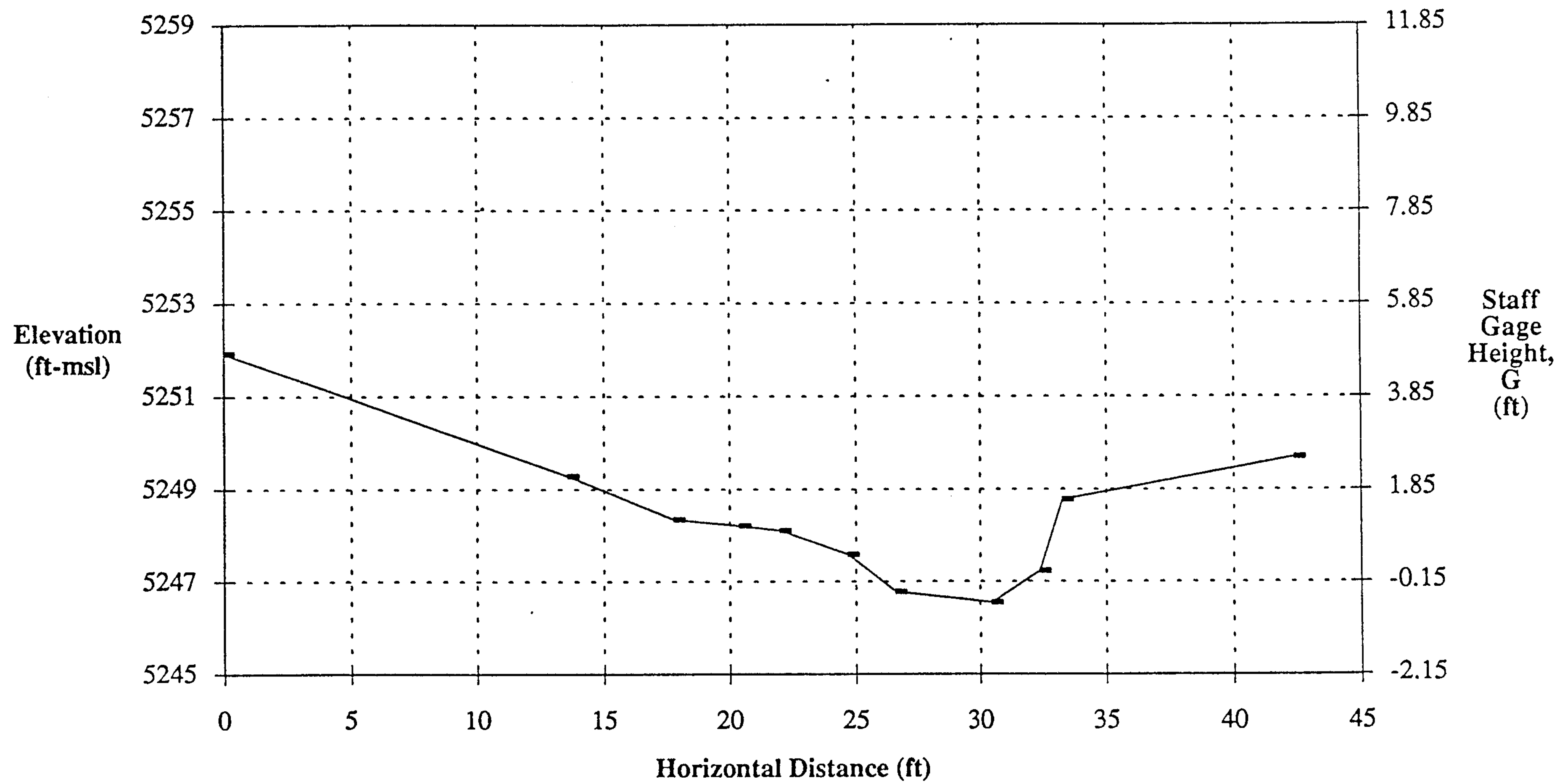

PEORIA INTERCEPTOR (STATION SW11001)
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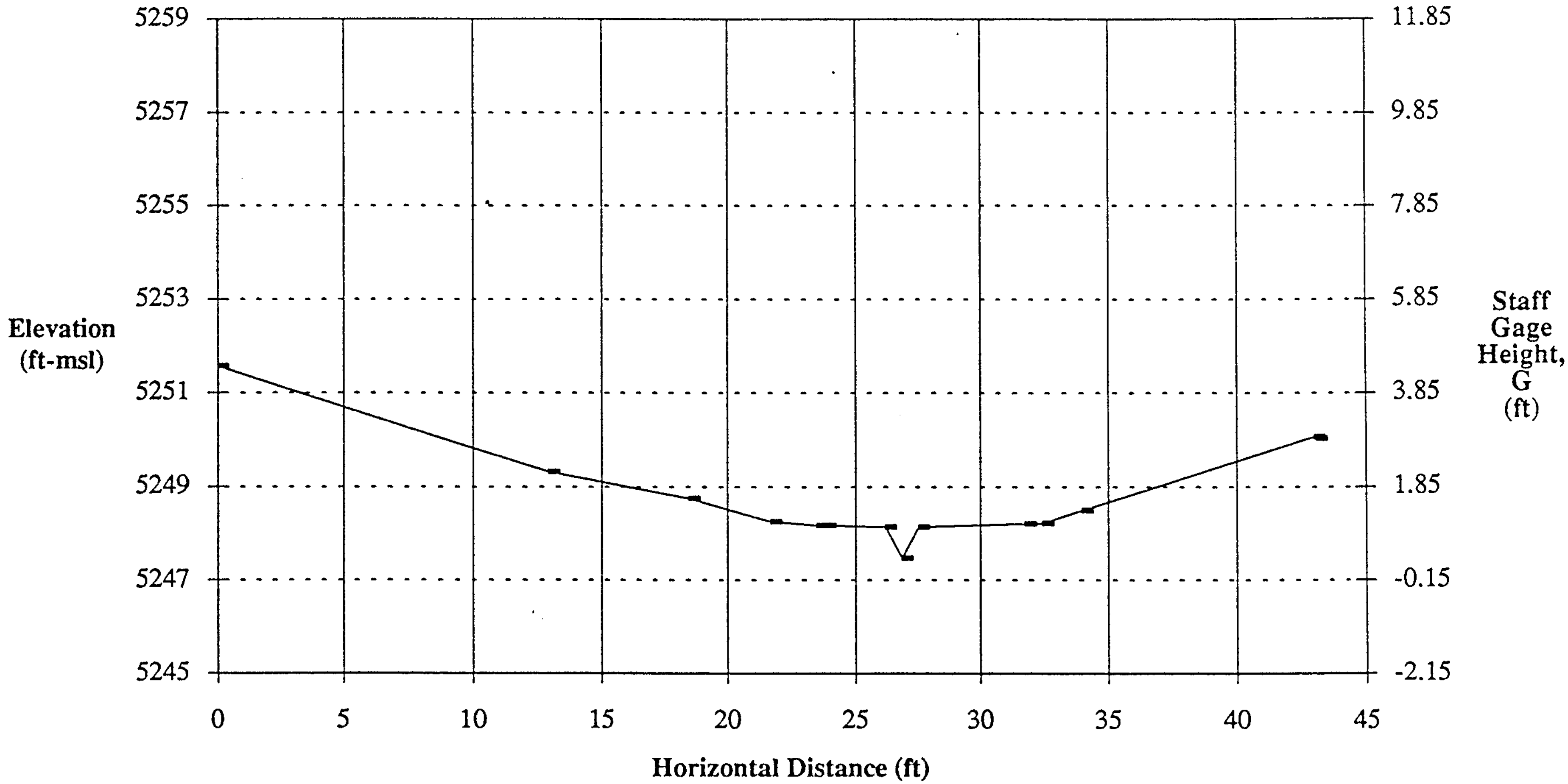
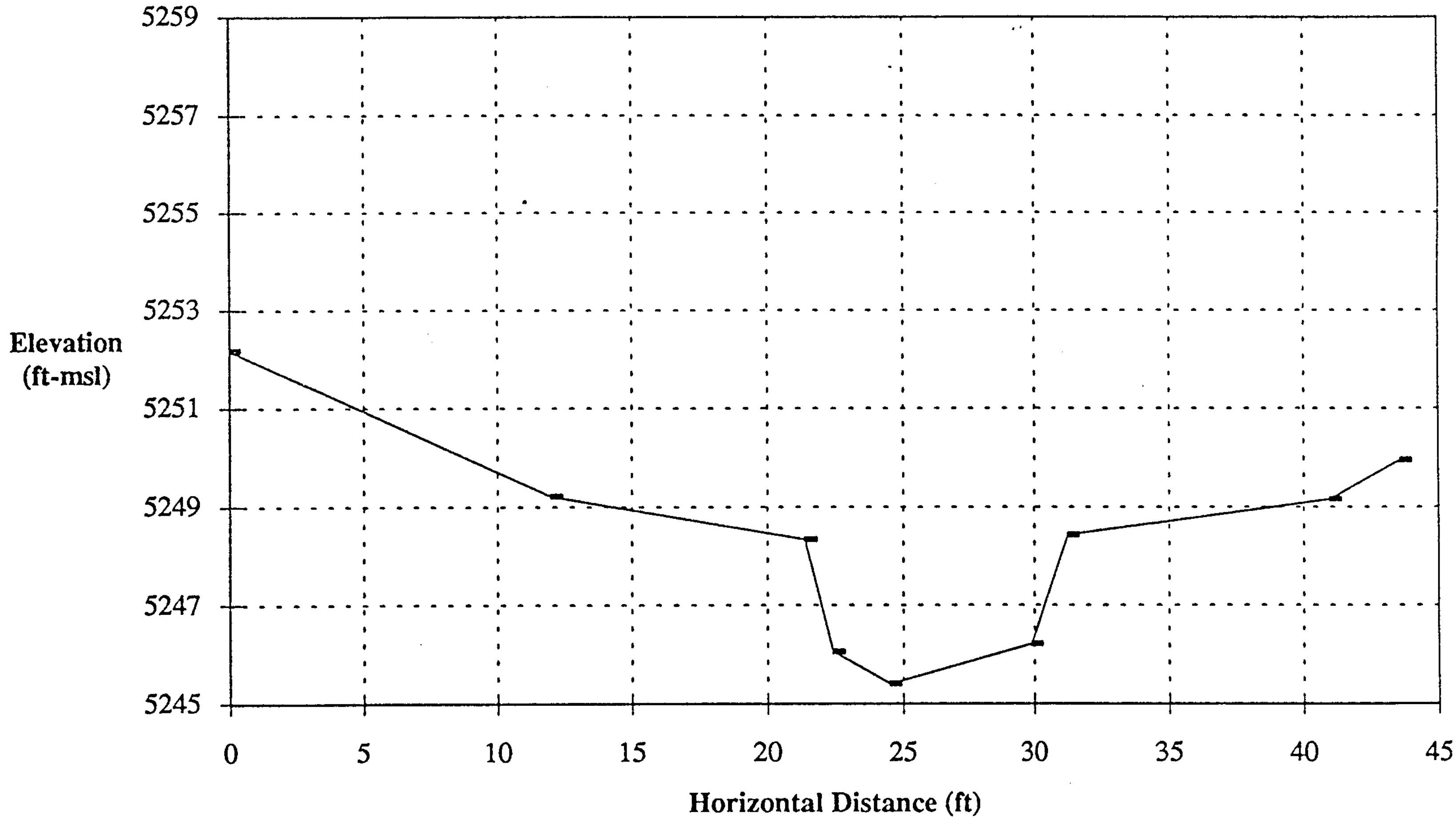
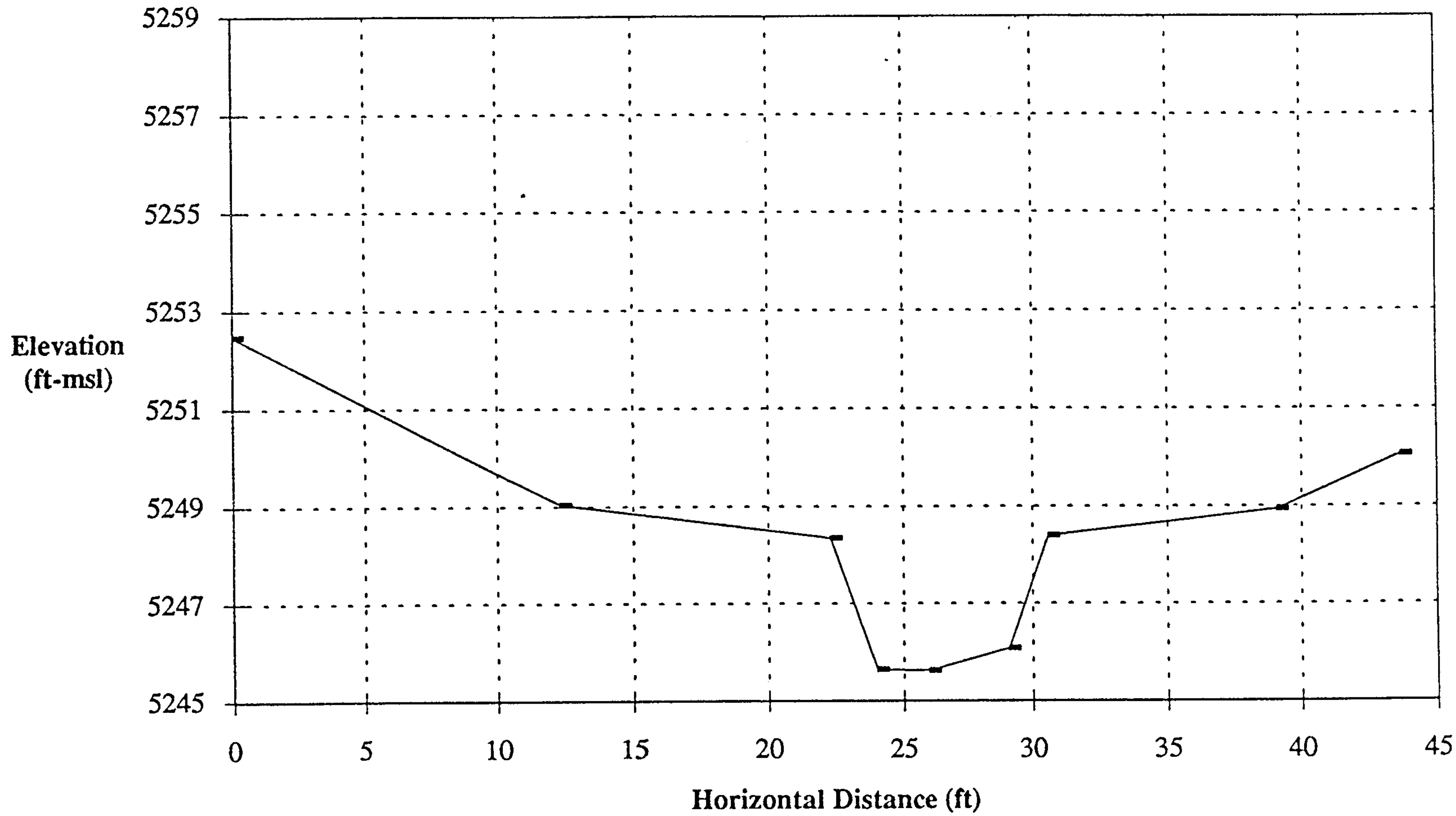


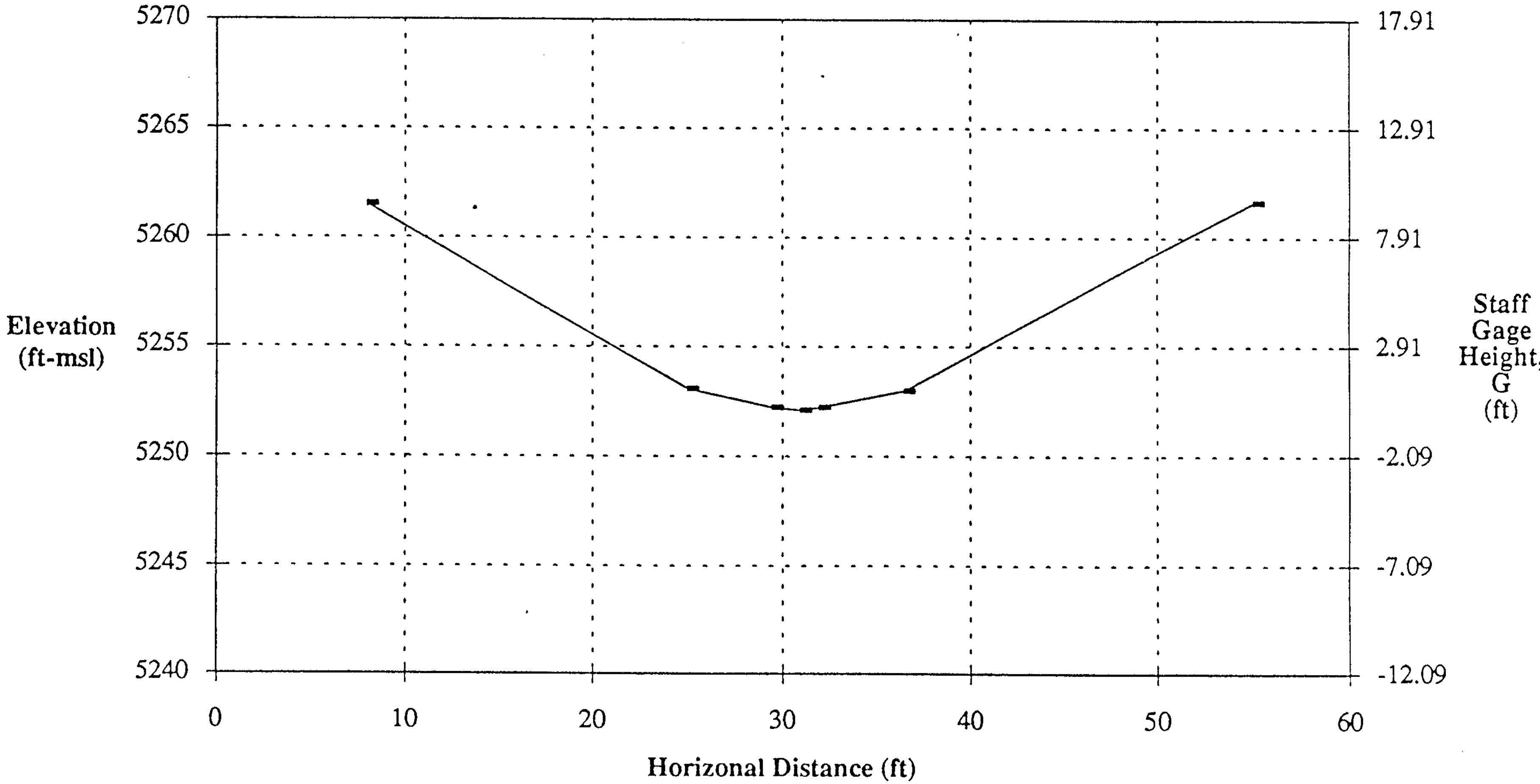
PEORIA INTERCEPTOR (STATION SW11001)
CROSS SECTION 5



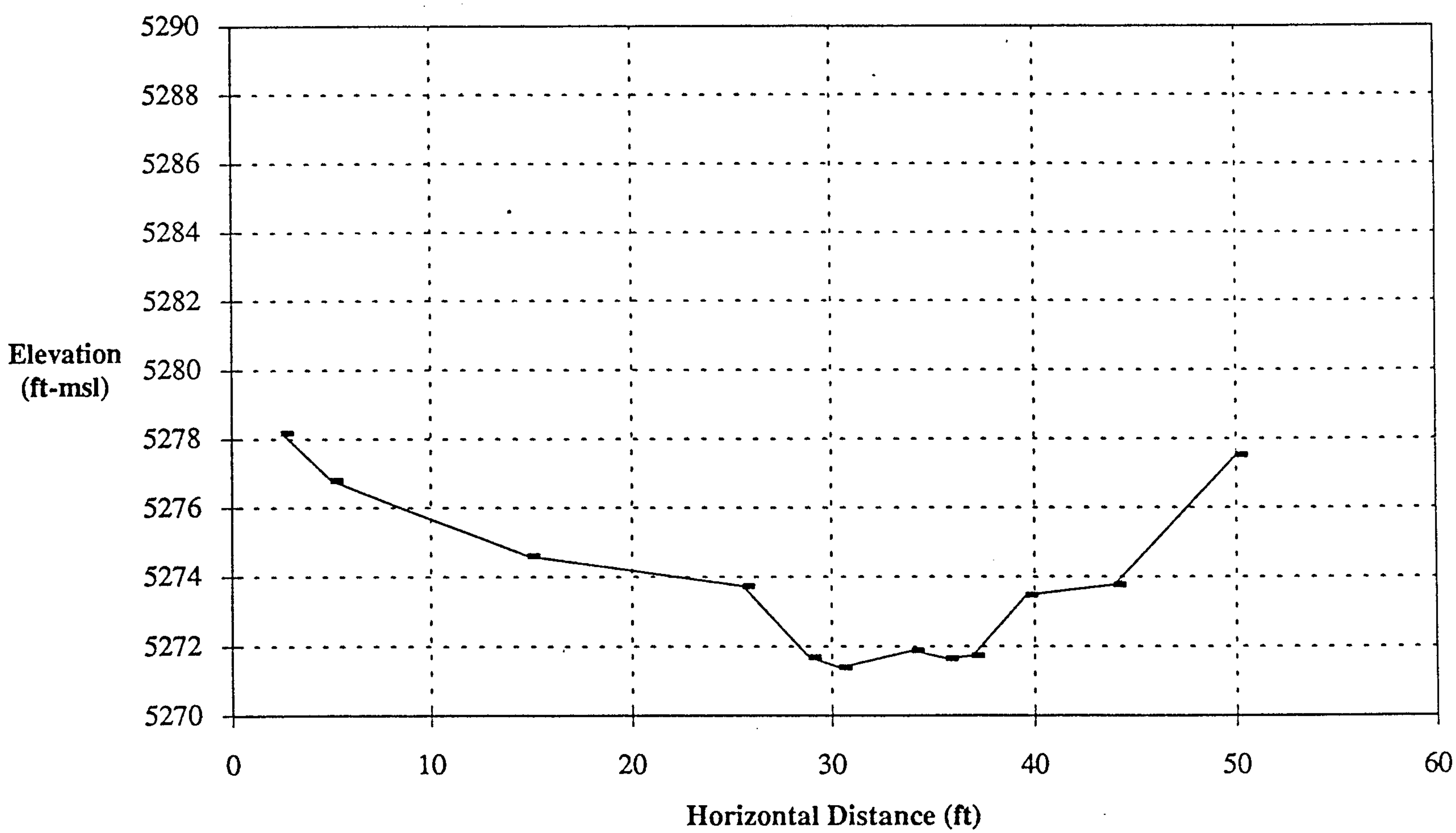
PEORIA INTERCEPTOR (STATION SW11001)
CROSS SECTION 6



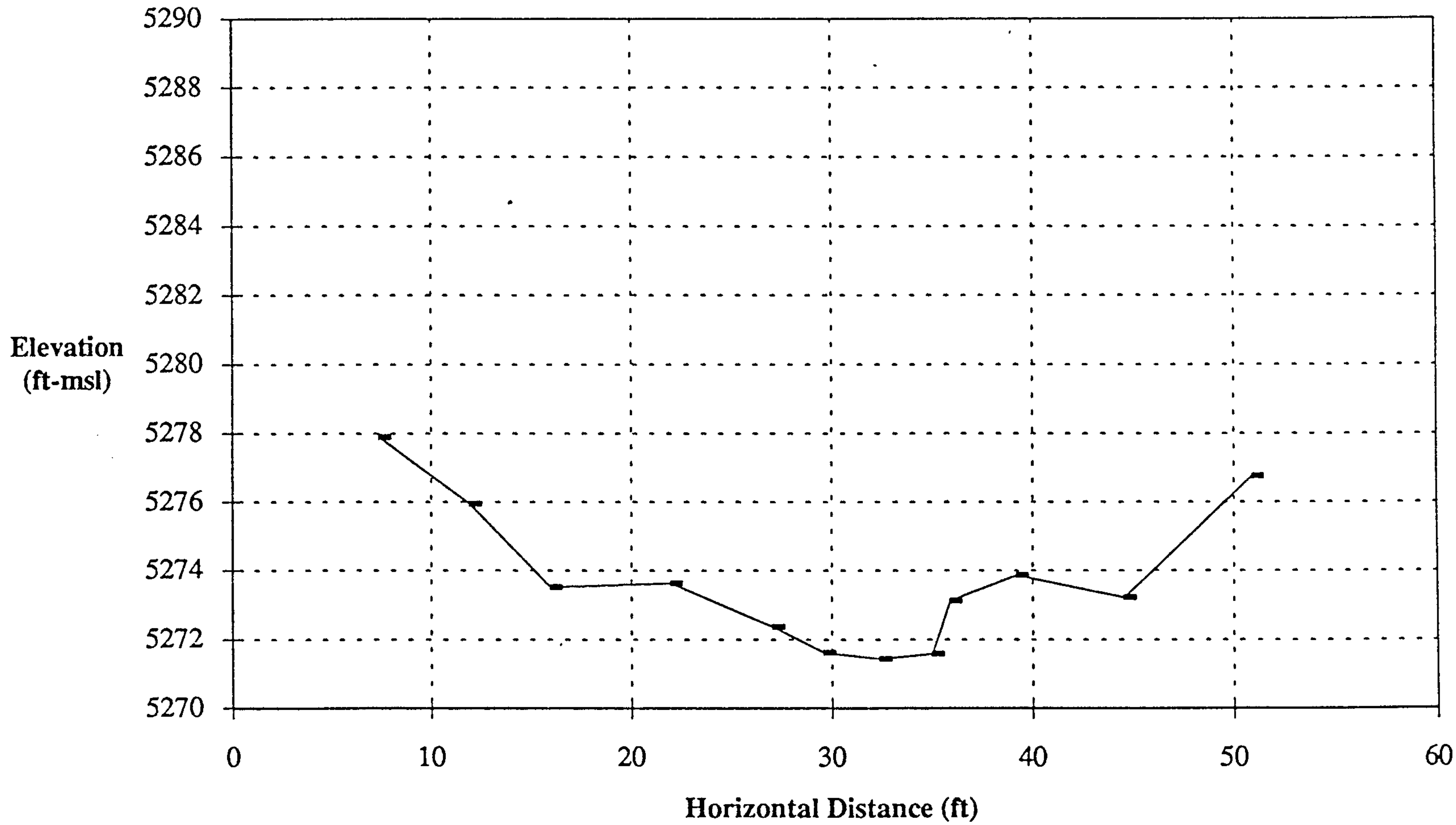
HAVANA INTERCEPTOR (STATION SW11002)
CROSS SECTION 1



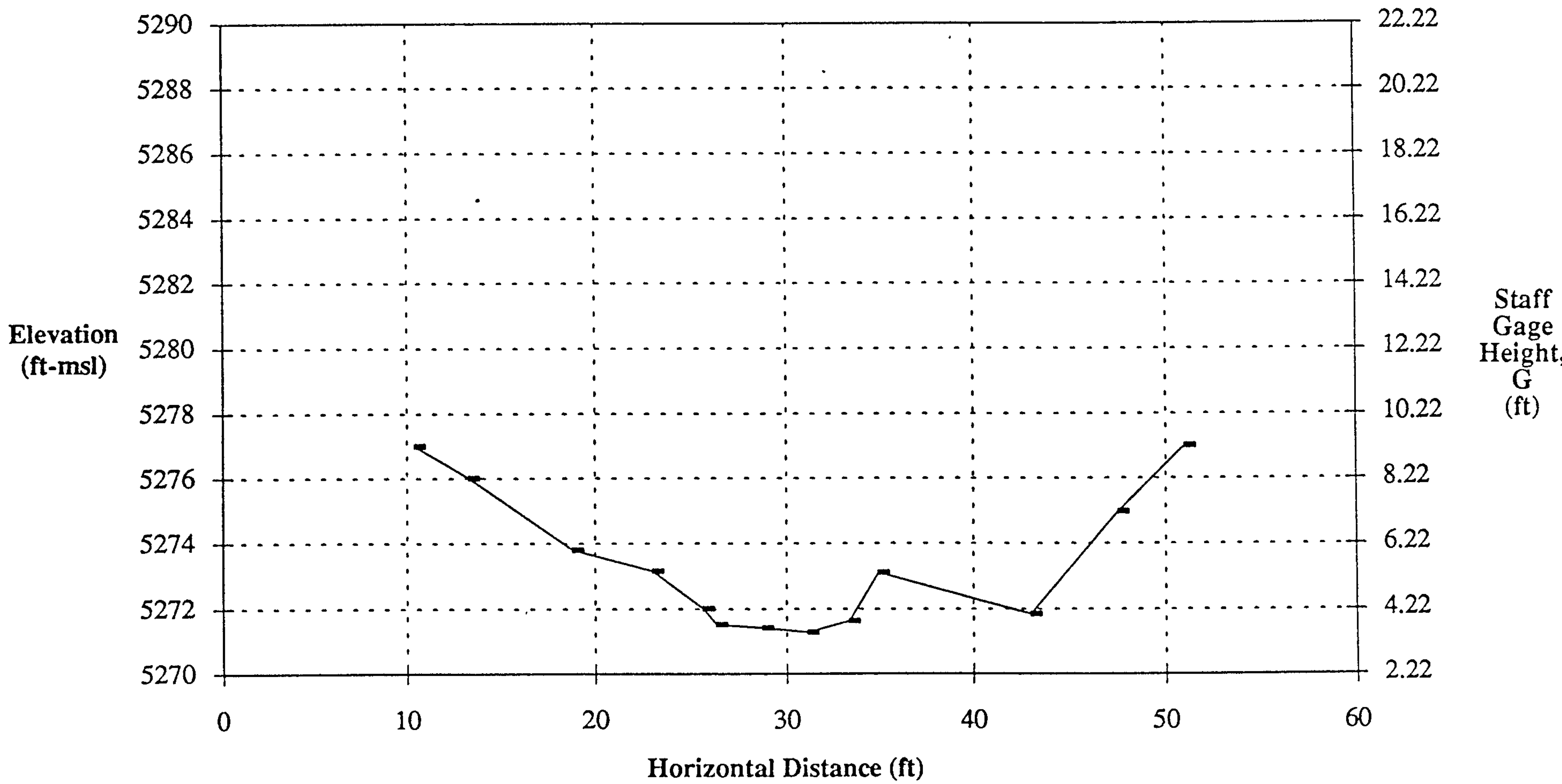
SOUTH UVALDA (STATION 12005)
CROSS SECTION 1



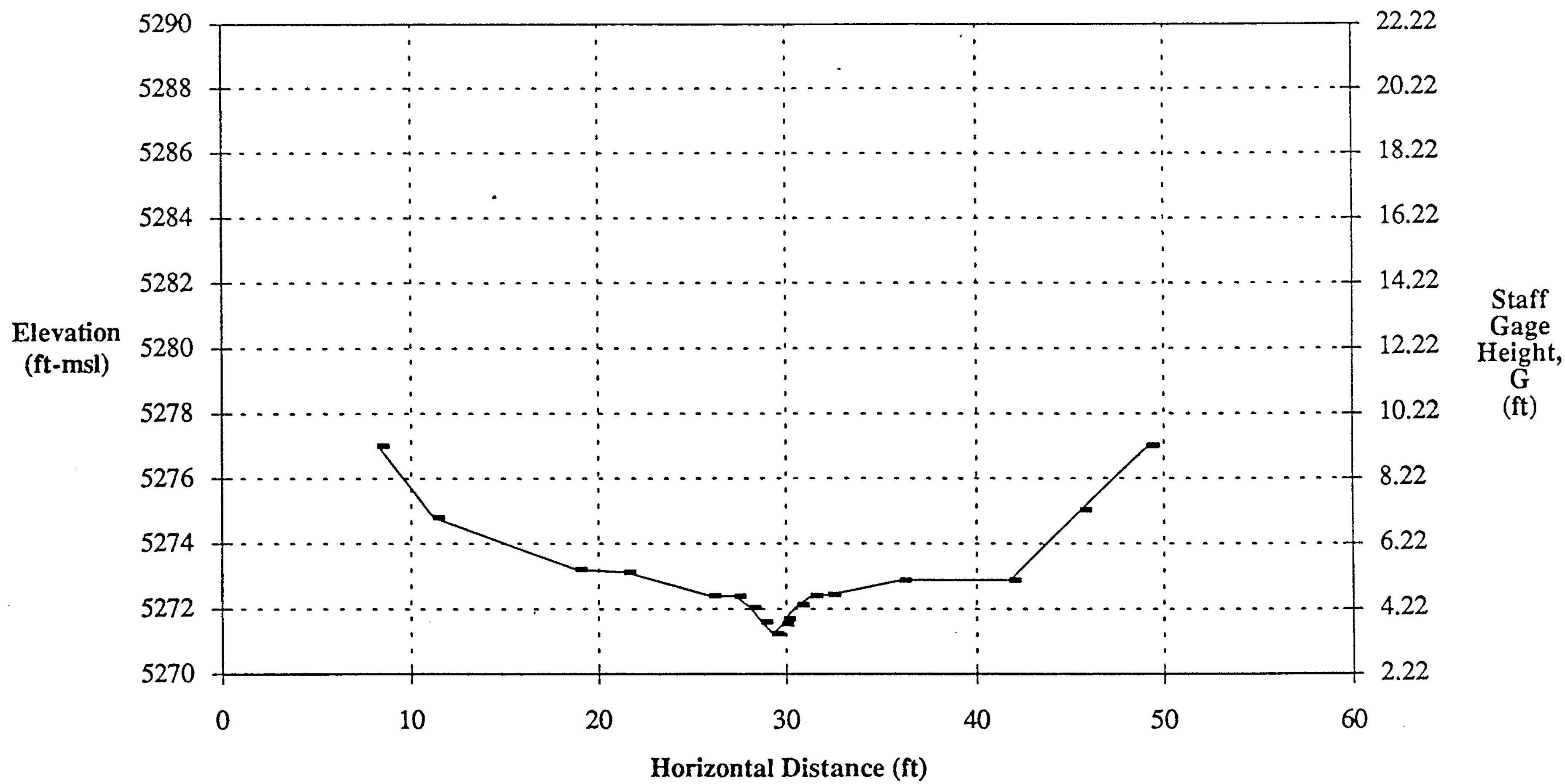
SOUTH UVALDA (STATION 12005)
CROSS SECTION 2



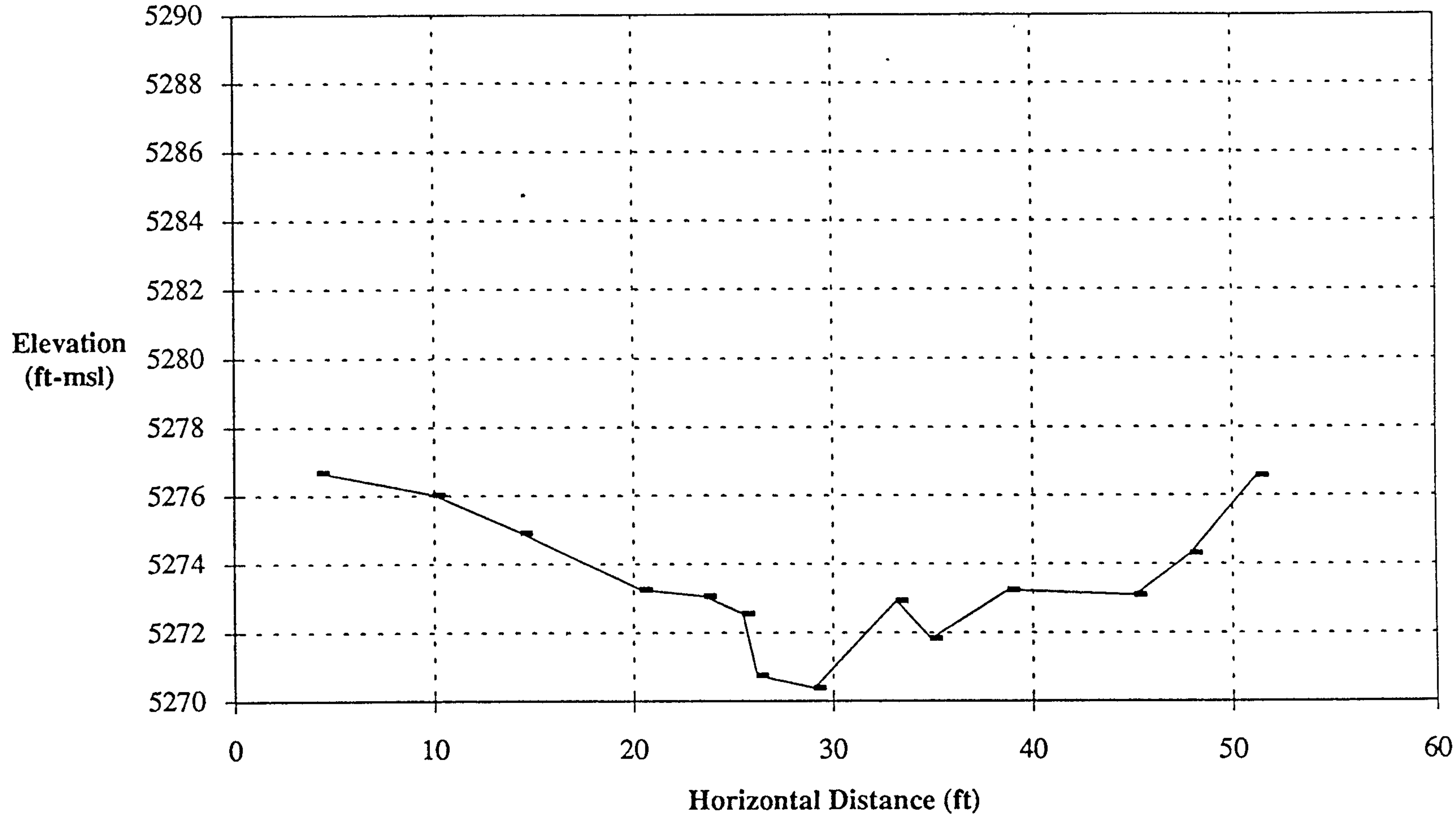
SOUTH UVALDA (STATION SW12005)
CROSS SECTION 3



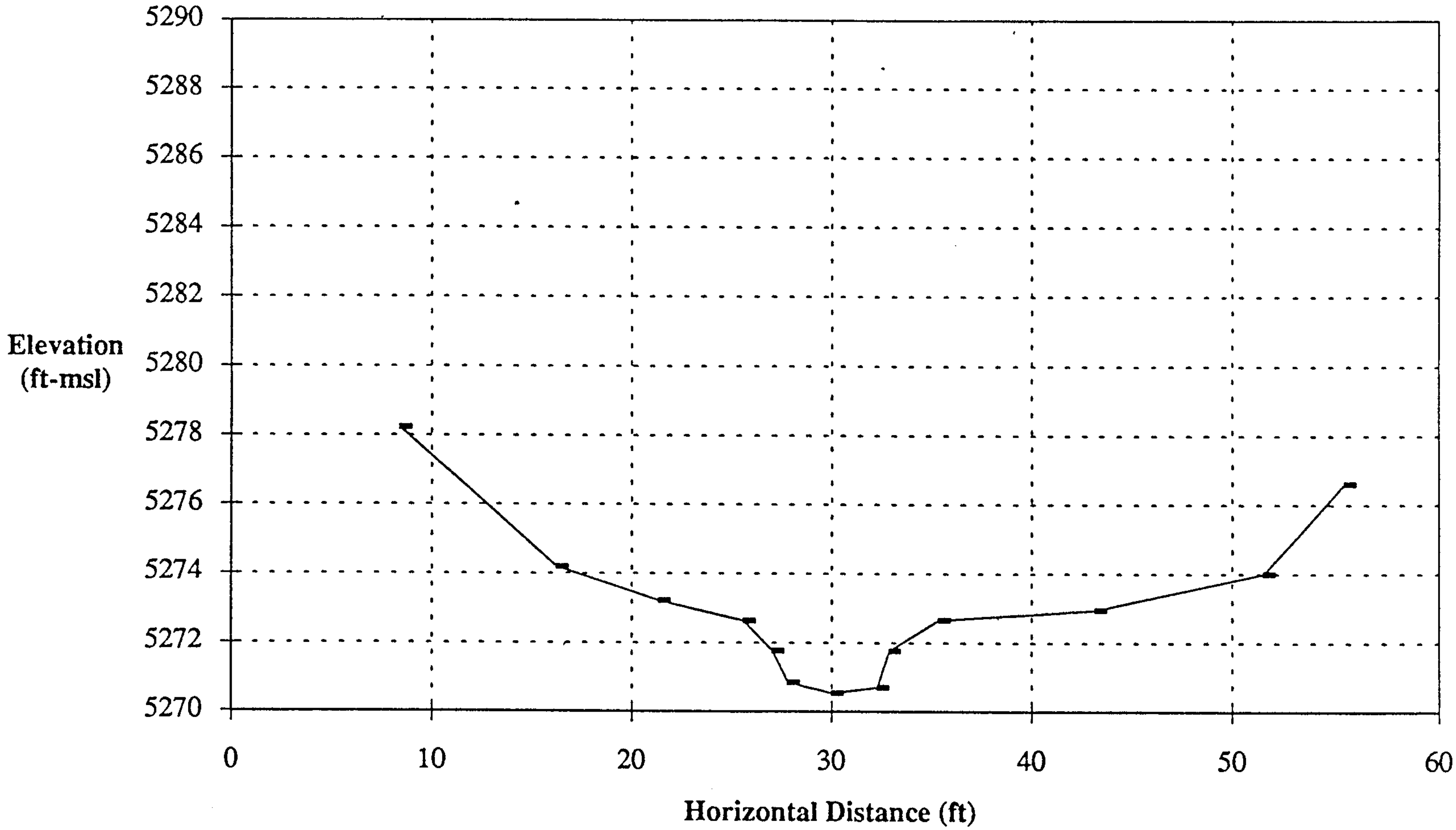
SOUTH UVALDA (STATION SW12005)
CROSS SECTION 4



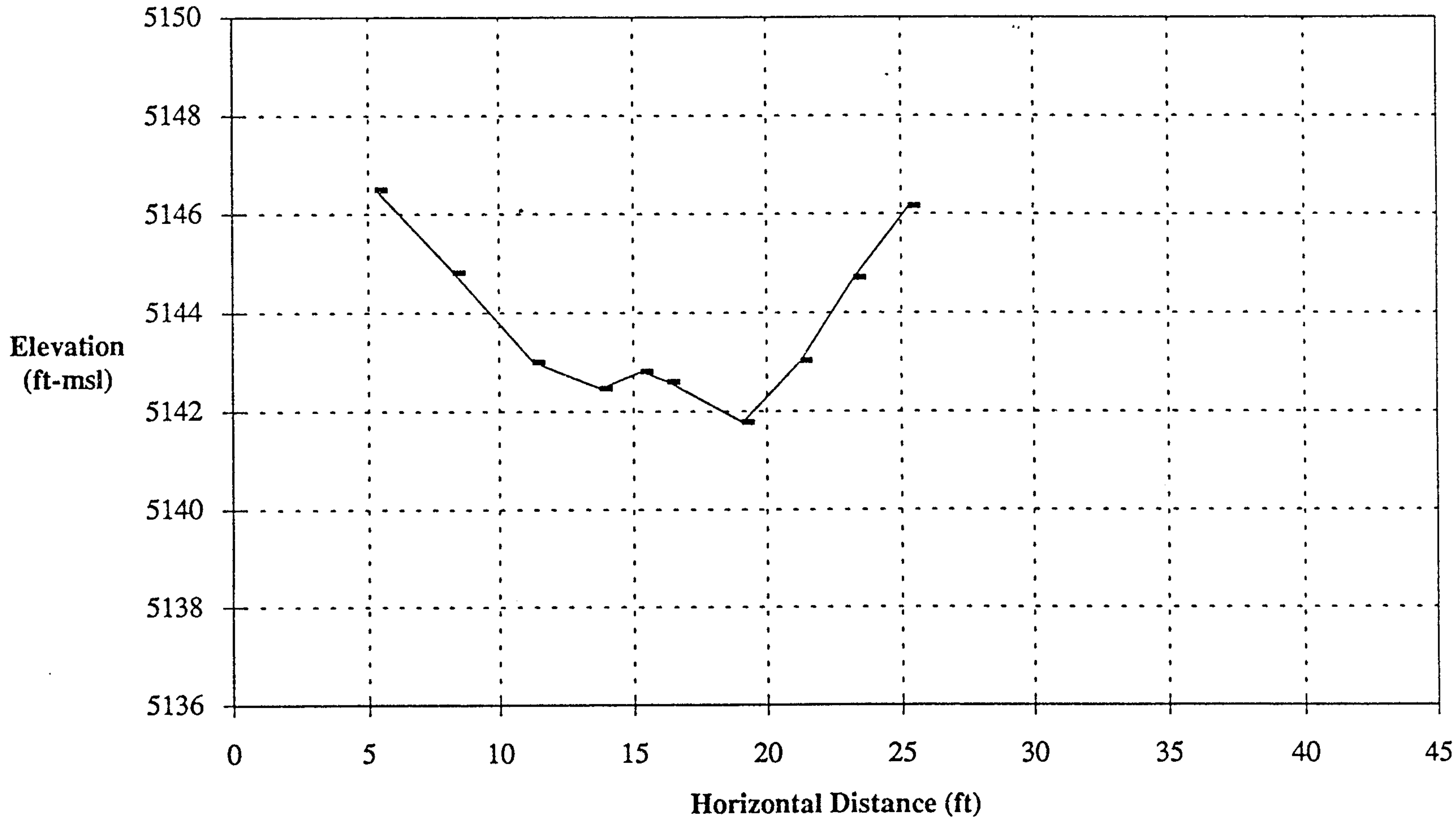
SOUTH UVALDA (STATION SW12005)
CROSS SECTION 5



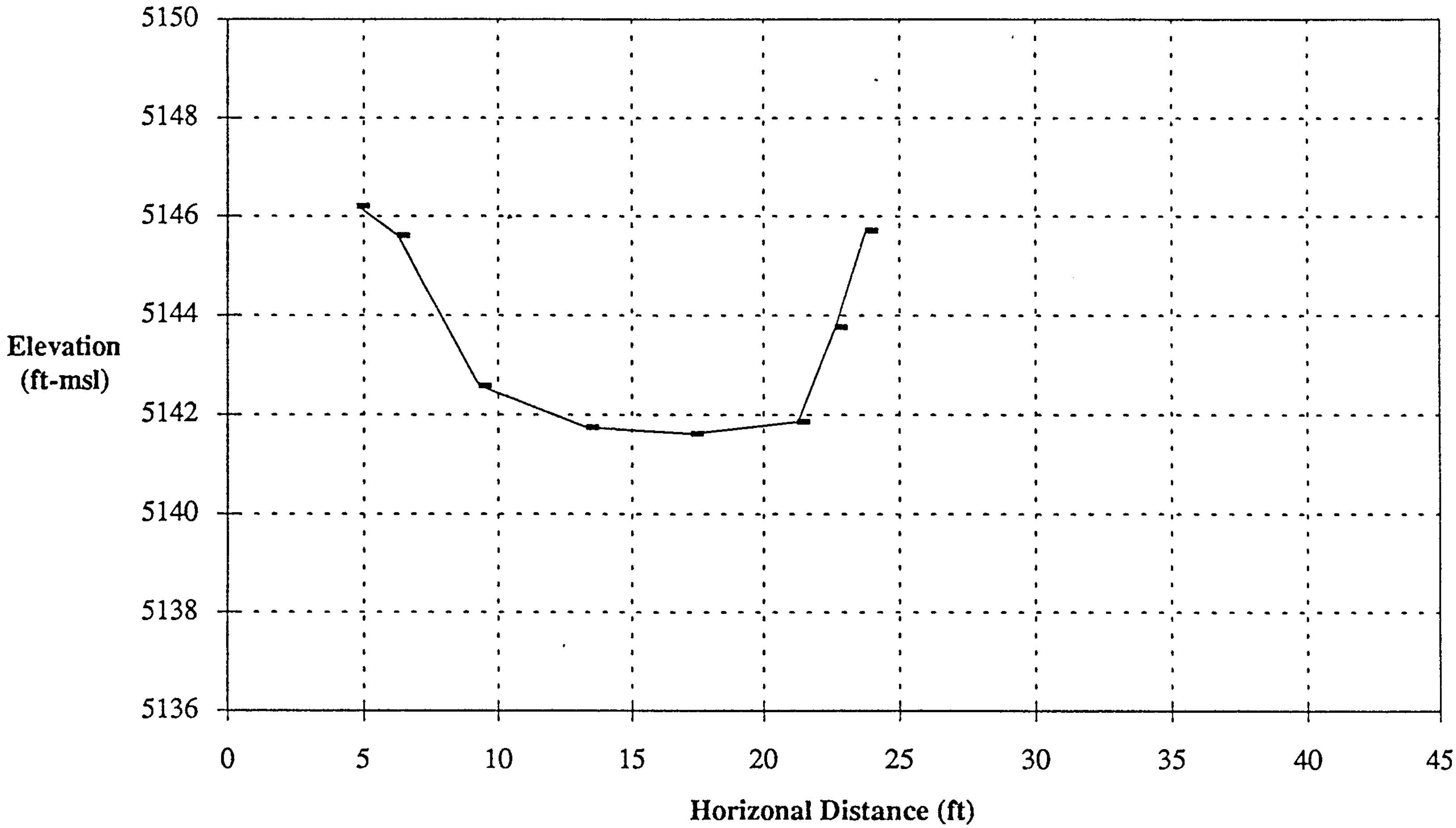
SOUTH UVALDA (STATION SW12005)
CROSS SECTION 6



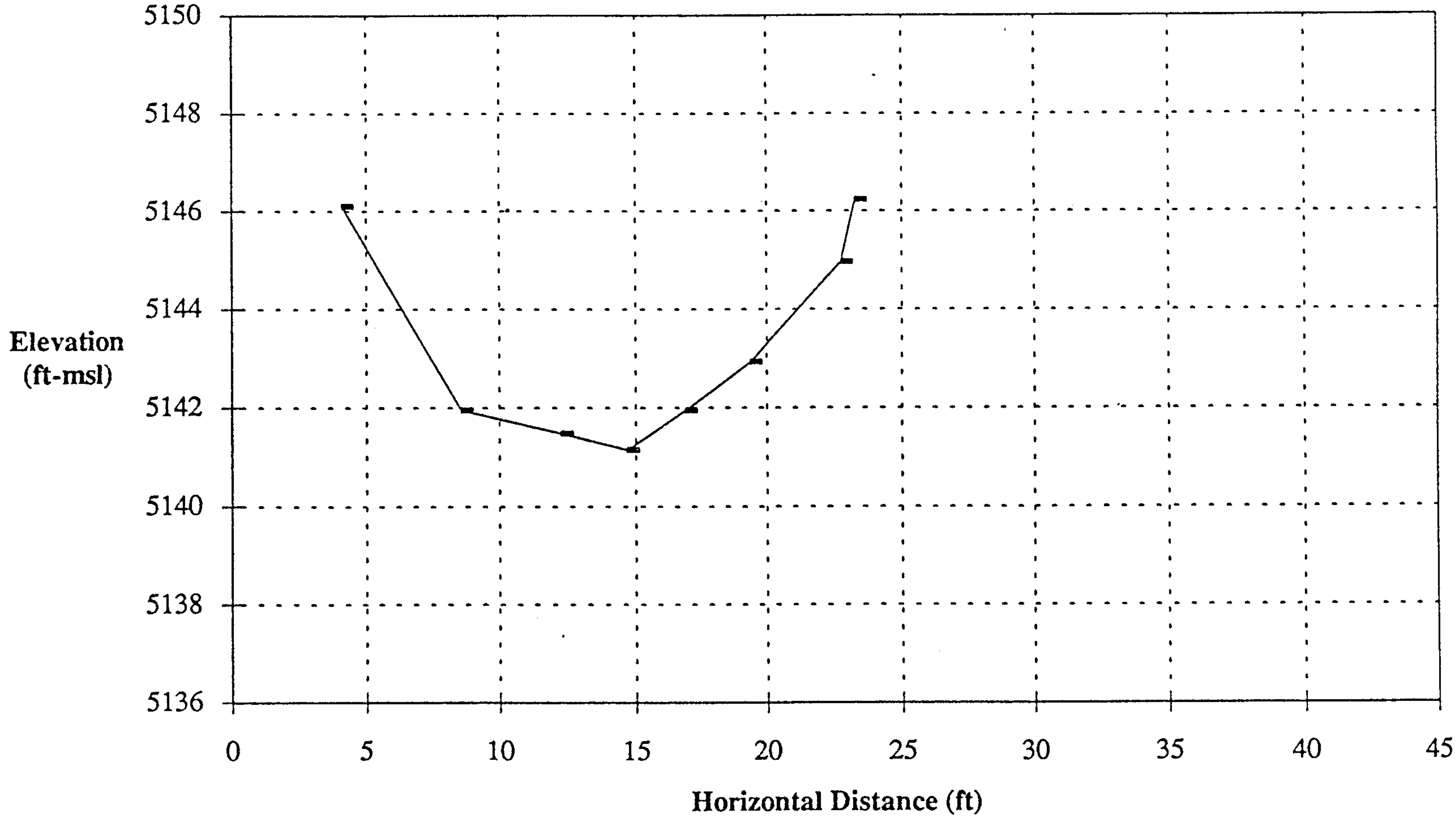
NORTH FIRST CREEK (STATION SW24002)
CROSS SECTION 1



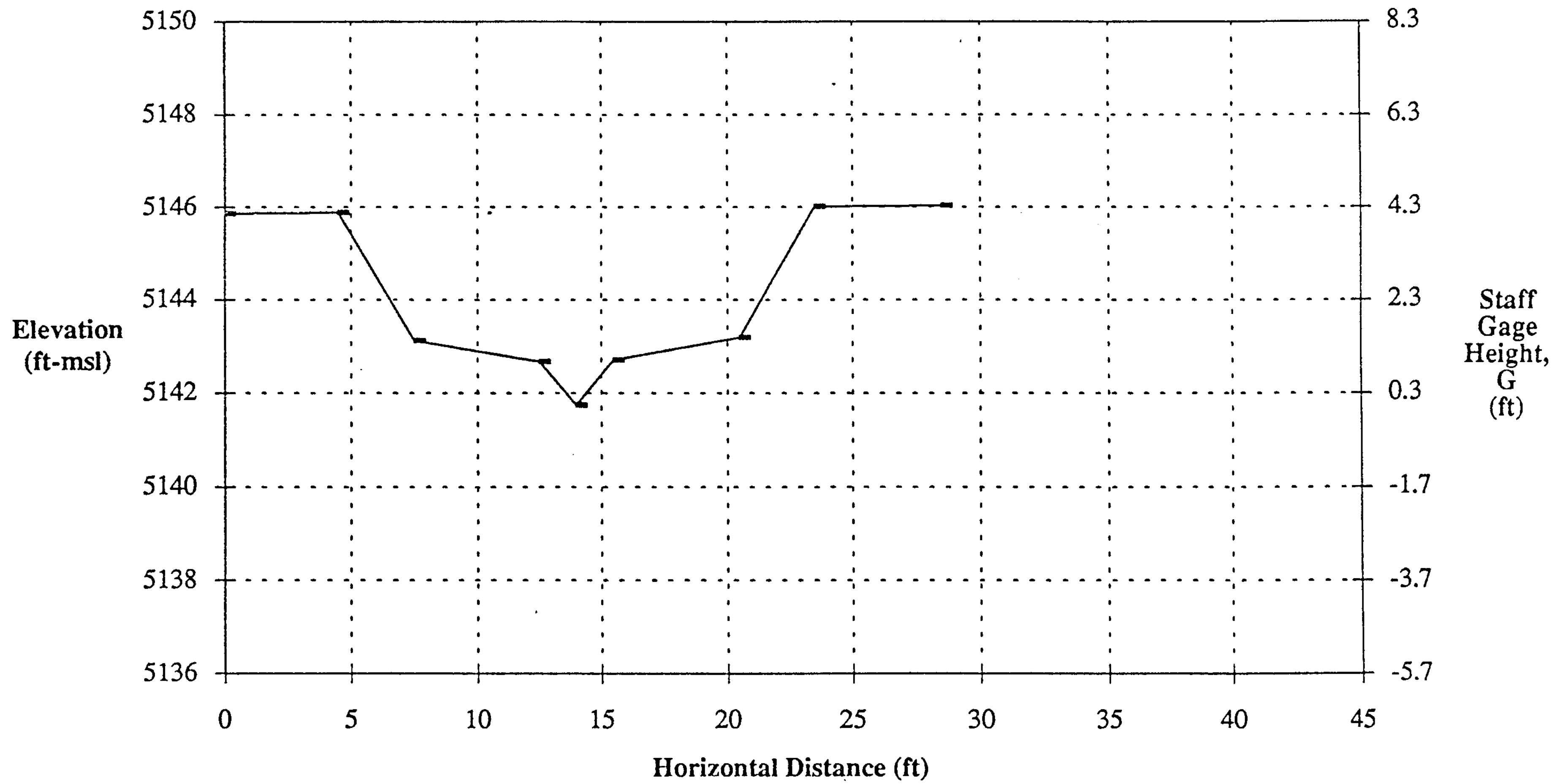
NORTH FIRST CREEK (STATION SW24002)
CROSS SECTION 2



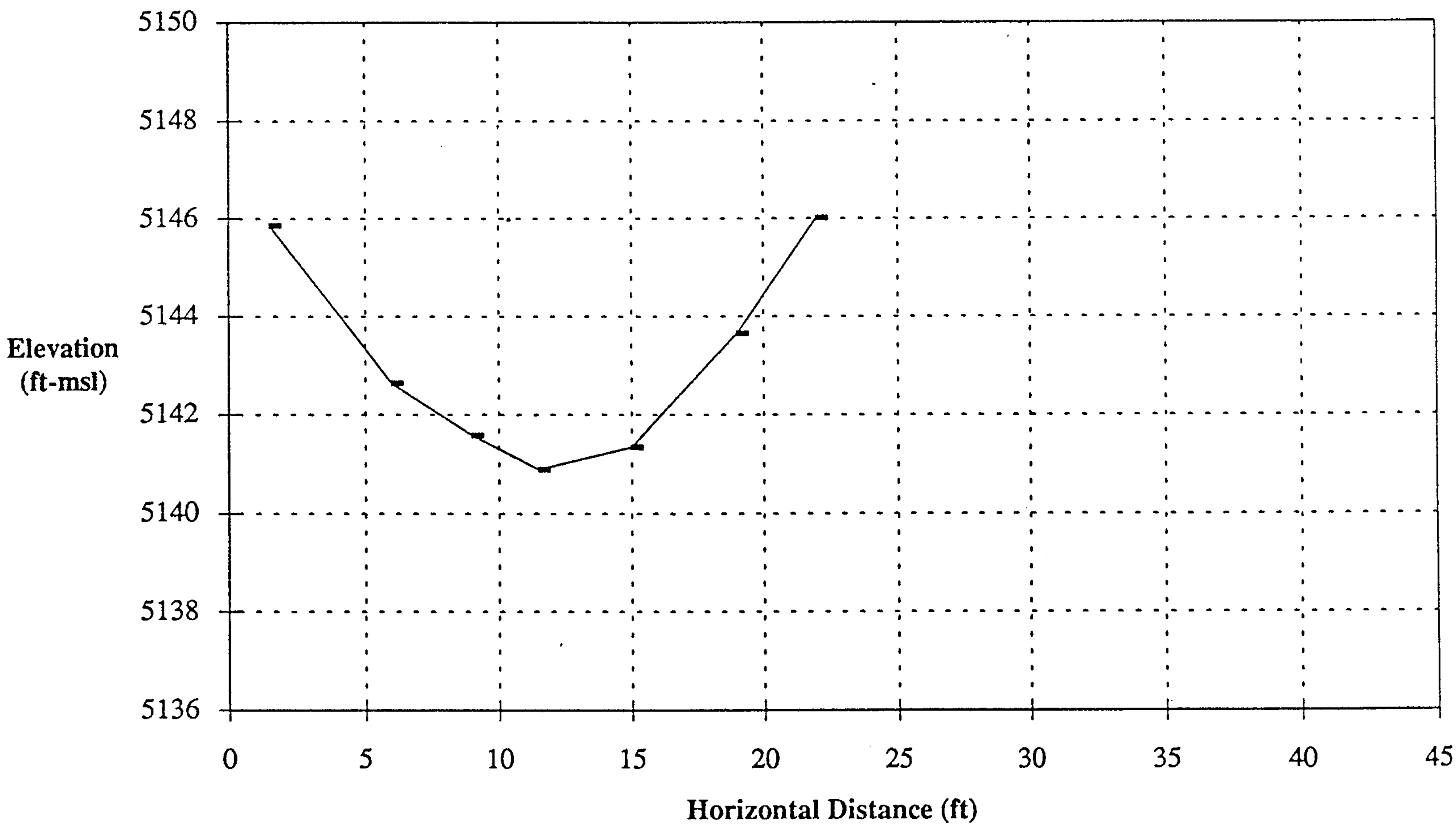
NORTH FIRST CREEK (STATION SW24002)
CROSS SECTION 3



NORTH FIRST CREEK (STATION SW24002)
CROSS SECTION 4

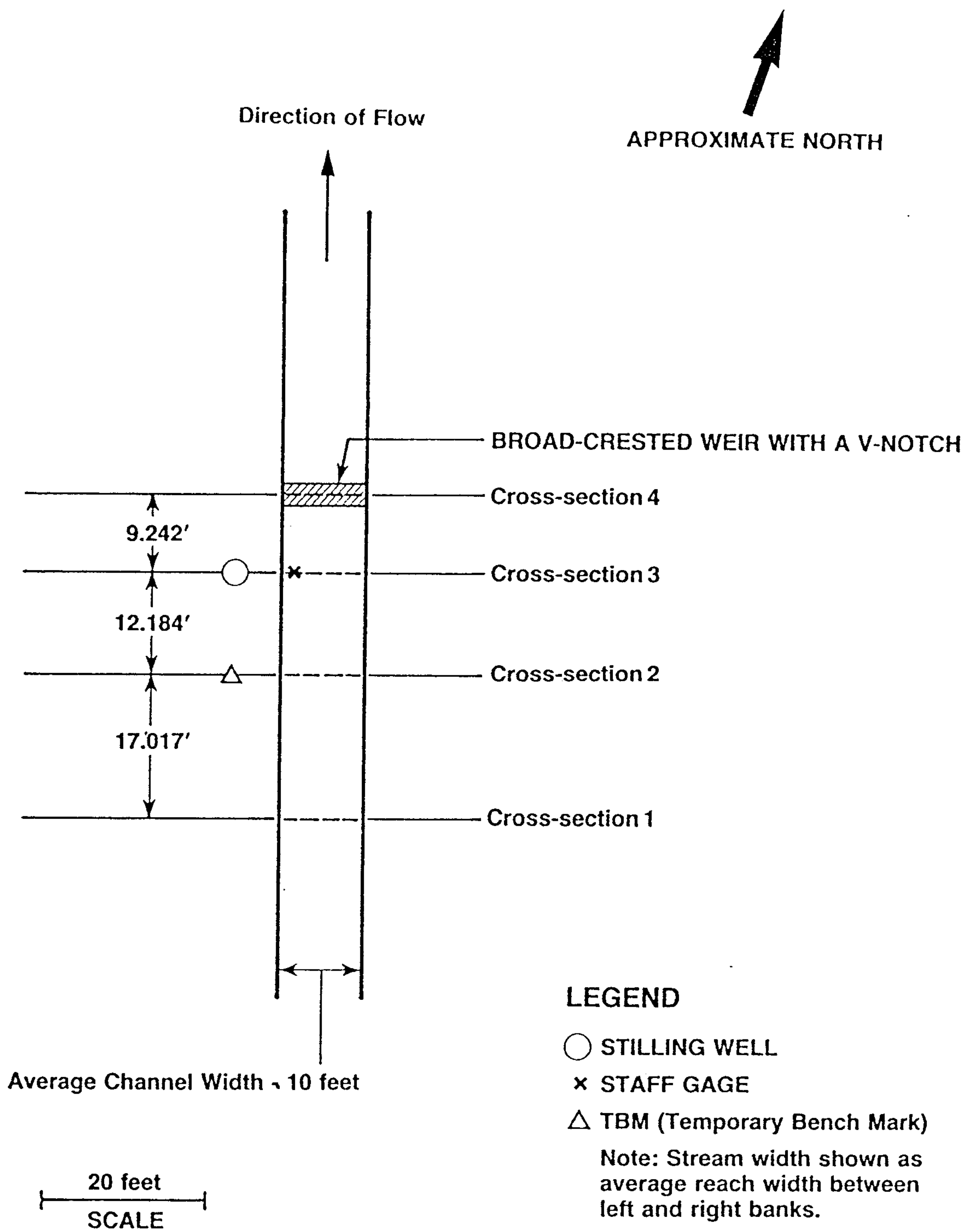


NORTH FIRST CREEK (STATION SW24002)
CROSS SECTION 5



APPENDIX A-1.2.2

Monitoring Station Plan Views



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Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by:
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Riverside Technology, Inc.

Figure A-1.2.2-1

North Uvalda (SW01001)
Cross-Section Locations

CMP SW FY89

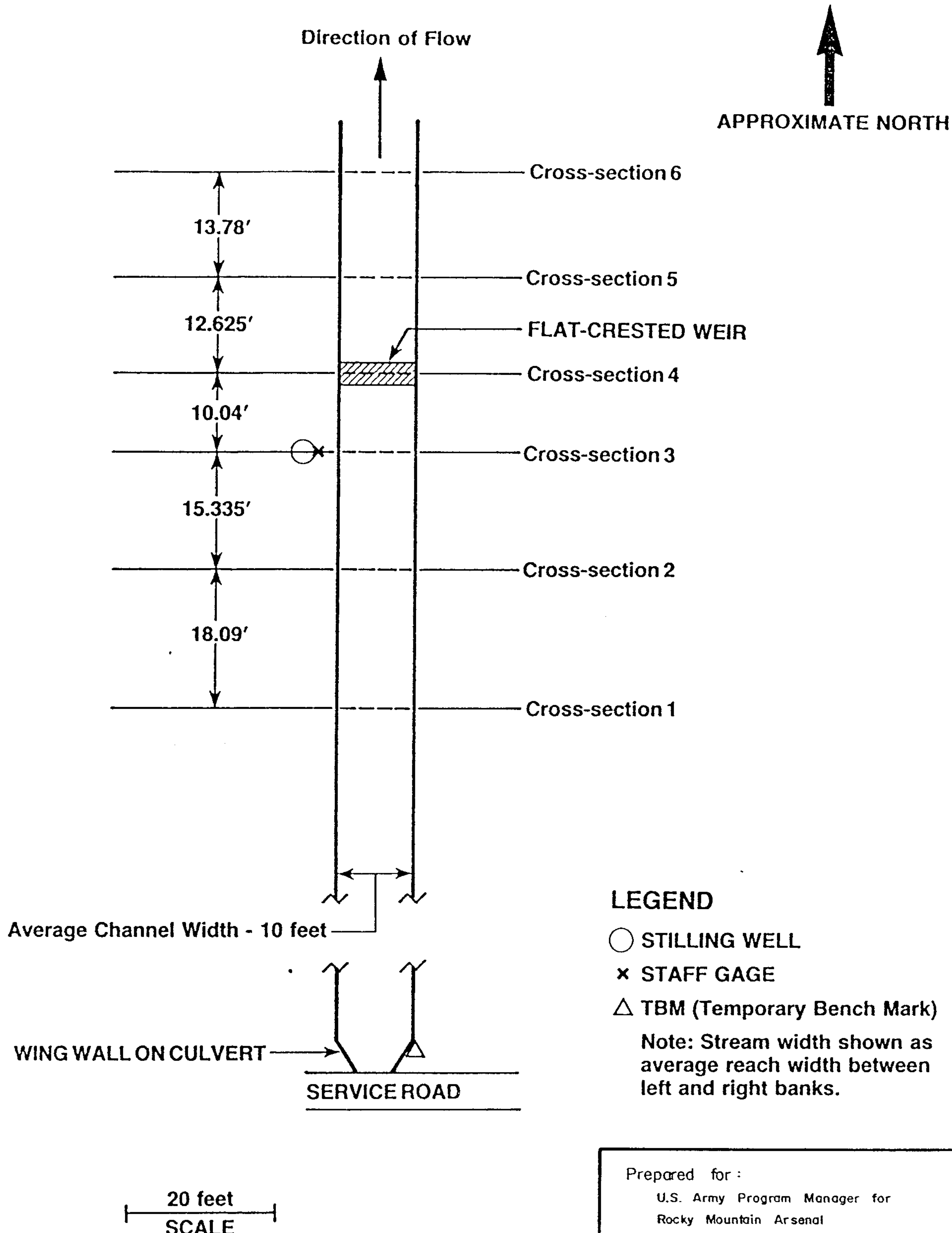

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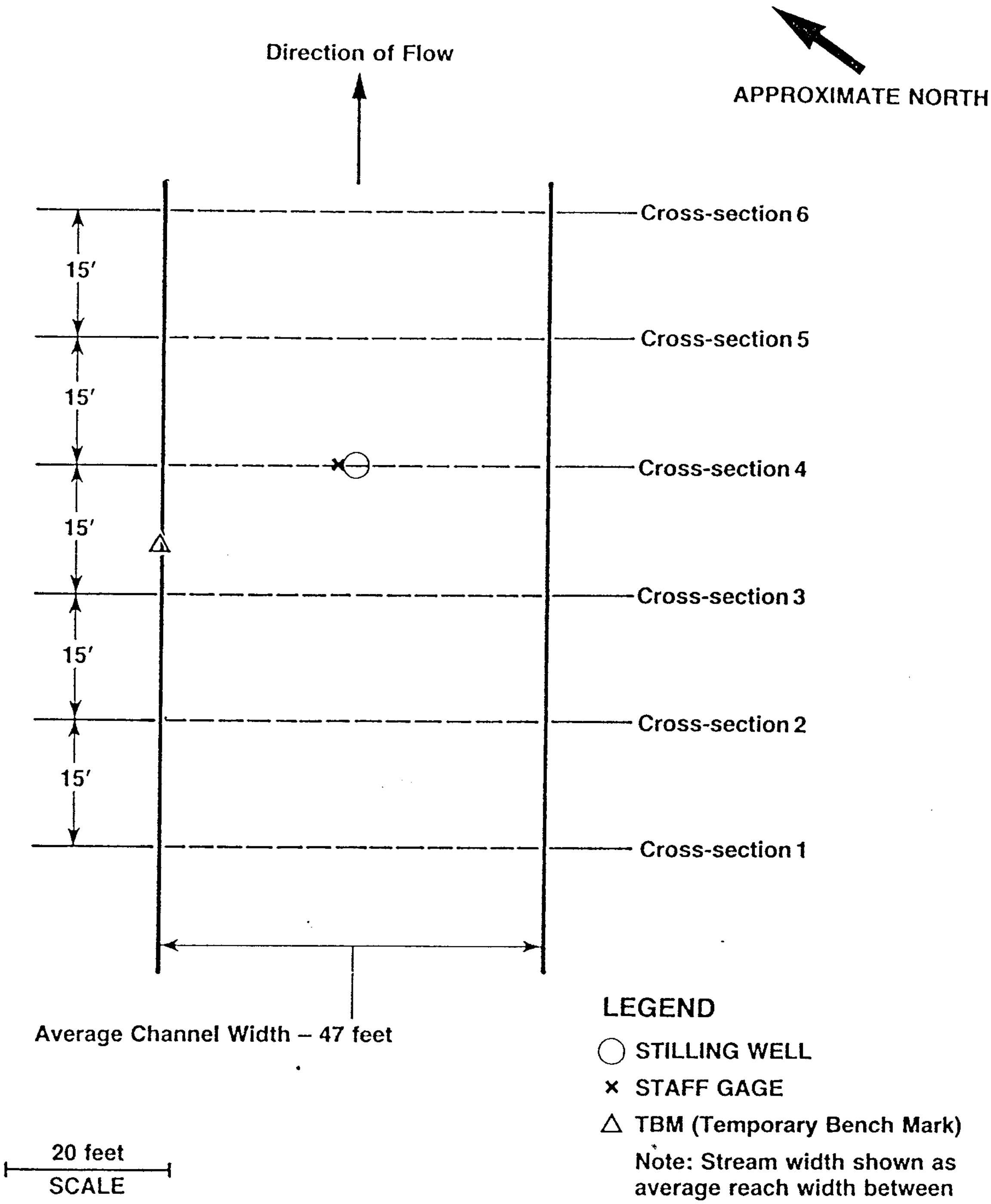
Figure A-1.2.2-2

Peoria Interceptor (SW11001) Cross-Section Locations

CMP SW FY89



LEGEND

○ STILLING WELL

× STAFF GAGE

△ TBM (Temporary Bench Mark)

Note: Stream width shown as average reach width between left and right banks.

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Figure A-1.2.2-3
Havana Interceptor (SW11002)
Cross-Section Locations

CMP SW FY89

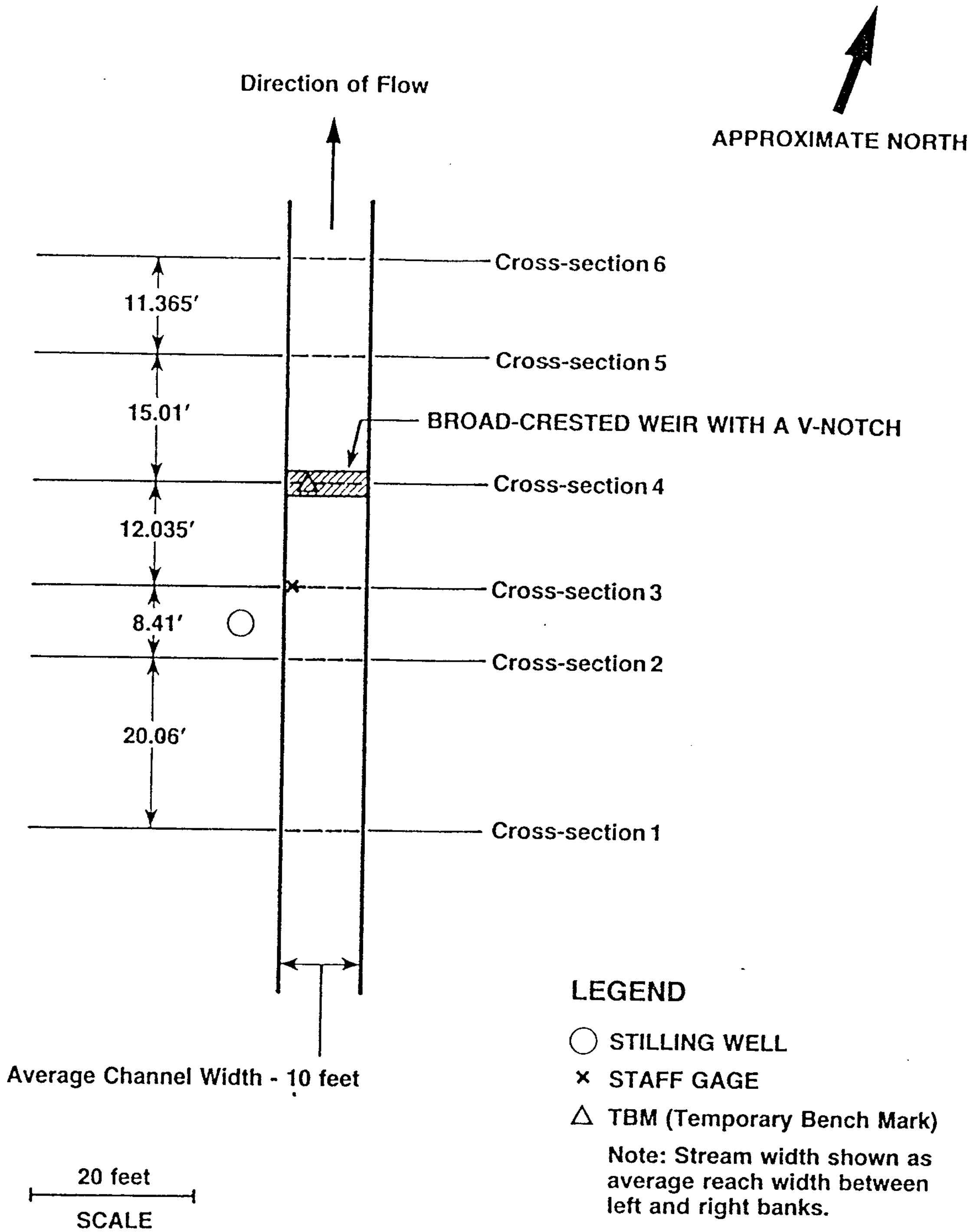

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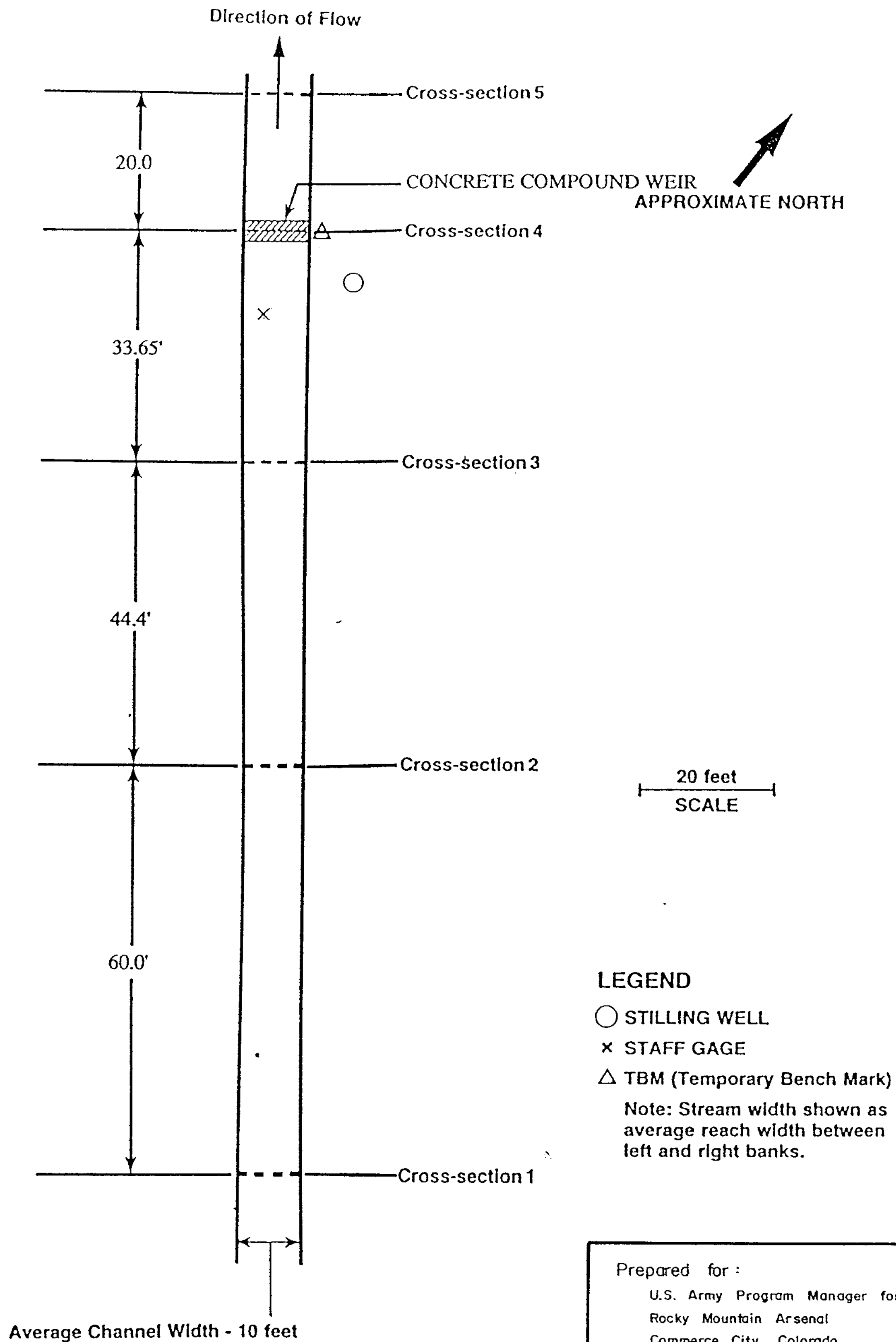
Figure A-1.2.2-4

South Uvalda (SW12005)
Cross-Section Locations

CMP SW FY89



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Riverside Technology, Inc.

Figure A-1.2.2-5

North First Creek
(SW24002)
Cross-Section Locations

CMP SW FY89

APPENDIX A-1.2.3

Cross Section Survey Data

Appendix A-1.2.3

Table A-1.2.3-1 North Uvalda (SW01001) Cross Section Survey Data

Horizontal Distance (ft)	Elevation (ft-msl)	Horizontal Distance (ft)	Elevation (ft-msl)
Cross Section 1		Cross Section 3	
0.00	5260.980	0.40	5259.105
4.00	5259.310	2.40	5258.305
6.30	5257.915	4.40	5255.750
7.90	5256.425	6.60	5255.955
10.20	5255.925	7.20	5255.760
12.20	5256.090	8.20	5255.800
13.60	5255.805	10.00	5255.715
17.90	5255.925	13.20	5255.855
18.60	5256.370	14.00	5256.350
19.40	5256.655	15.70	5256.690
21.20	5257.445	17.30	5256.855
22.50	5257.550		
Cross Section 2		Cross Section 4	
0.00	5259.740	0.00	5260.040
4.00	5258.070	3.00	5259.055
6.00	5256.995	5.60	5257.840
7.50	5255.810	6.00	5257.040
10.00	5255.745	9.10	5256.315
11.70	5255.695	11.40	5256.025
12.60	5255.865	12.70	5255.790
14.70	5255.930	13.40	5255.695
15.70	5256.525	14.10	5255.775
19.40	5257.535	16.00	5256.125
24.50	5256.675	17.50	5256.585
28.50	5258.010	19.00	5256.675
		20.50	5256.775
		21.40	5257.095
		24.00	5257.880
		30.30	5258.400

Appendix A-1.2.3

Table A-1.2.3-2 Peoria Interceptor (SW11001) Cross Section Survey Data

Horizontal Distance (ft)	Elevation (ft-msl)	Horizontal Distance (ft)	Elevation (ft-msl)
Cross Section 1		Cross Section 4	
0.00	5252.665	0.00	5251.580
9.40	5250.400	12.90	5249.315
24.60	5248.695	18.50	5248.760
25.30	5247.295	21.70	5248.260
29.40	5246.470	23.50	5248.180
30.90	5247.235	23.80	5248.480
31.50	5249.005	26.20	5248.150
33.80	5249.690	26.87	5247.480
41.80	5250.525	27.54	5248.150
		31.80	5248.210
		32.50	5248.220
		34.00	5248.500
		43.00	5250.070
		43.10	5250.030
Cross Section 2		Cross Section 5	
0.00	5251.955	0.00	5252.185
14.00	5249.655	12.00	5249.215
22.40	5248.570	21.40	5248.345
23.90	5247.630	22.40	5246.060
27.20	5247.095	24.50	5245.410
32.50	5247.590	29.90	5246.225
33.00	5248.970	31.30	5248.435
40.00	5249.700	41.00	5249.155
42.30	5250.205	43.60	5249.950
Cross Section 3		Cross Section 6	
0.00	5251.935	0.00	5252.480
13.60	5249.290	12.30	5249.045
17.80	5248.355	22.30	5248.350
20.40	5248.215	24.00	5245.625
22.00	5248.115	26.00	5245.625
24.70	5247.590	29.10	5246.085
26.60	5246.790	29.10	5246.085
30.50	5246.555	39.10	5248.935
32.40	5247.235	43.70	5250.055
33.30	5248.780		
42.40	5249.695		

Appendix A-1.2.3

Table A-1.2.3-3 Havana Interceptor (SW11002) Cross Section Survey Data

Horizontal Distance (ft)	Elevation (ft-msl)
8.00	5261.540
25.00	5253.075
29.50	5252.215
31.00	5252.090
32.00	5252.220
36.50	5252.975
55.00	5261.645

Appendix A-1.2.3

Table A-1.2.3-4 South Uvalda (SW12005) Cross Section Survey Data

Horizontal Distance (ft)	Elevation (ft-msl)	Horizontal Distance (ft)	Elevation (ft-msl)
Cross Section 1		Cross Section 3	
2.50	5278.170	10.42	5277.000
5.00	5276.790	13.33	5276.020
14.80	5274.610	18.83	5273.810
25.60	5273.740	23.03	5273.170
28.90	5271.680	25.63	5272.005
30.40	5271.380	26.33	5271.515
33.90	5271.885	28.73	5271.425
35.60	5271.730	31.13	5271.285
36.90	5271.730	33.33	5271.635
39.60	5273.470	34.93	5273.105
44.00	5273.770	43.03	5271.845
50.00	5277.520	47.53	5274.990
		51.23	5277.130
Cross Section 2		Cross Section 4	
7.42	5277.890	6.02	5277.615
11.92	5275.955	11.22	5274.810
15.92	5273.515	18.82	5273.210
22.02	5273.635	21.42	5273.135
27.12	5272.370	25.92	5272.400
29.62	5271.615	27.32	5272.400
32.42	5271.440	28.12	5272.040
35.02	5271.580	28.72	5271.600
35.92	5273.120	29.32	5271.240
39.22	5273.870	29.82	5271.535
44.52	5273.220	29.92	5271.695
50.92	5276.760	30.62	5272.130
		31.32	5272.405
		32.22	5272.435
		35.92	5272.885
		41.82	5272.880
		45.62	5275.040
		49.22	5277.030

Table A-1.2.3-4 South Uvalda (SW12005) Cross Section Survey Data (continued)

Horizontal Distance (ft)	Elevation (ft-msl)	Horizontal Distance (ft)	Elevation (ft-msl)
Cross Section 5		Cross Section 6	
4.17	5276.700	8.42	5278.230
9.97	5276.040	16.22	5274.190
14.37	5274.915	21.42	5273.205
20.37	5273.265	25.62	5272.640
23.57	5273.070	27.02	5271.770
25.47	5272.560	27.82	5270.840
26.17	5270.740	30.02	5270.525
29.07	5270.385	32.32	5270.690
33.17	5272.930	32.92	5271.770
34.87	5271.835	35.42	5272.660
38.77	5273.245	43.22	5272.950
45.17	5273.100	51.52	5273.995
47.97	5274.305	55.42	5276.615
51.17	5276.580		

Appendix A-1.2.3

Table A-1.2.3-5 North First Creek (SW24002) Cross Section Survey Data

Horizontal Distance (ft)	Elevation (ft-msl)	Horizontal Distance (ft)	Elevation (ft-msl)
Cross Section 1		Cross Section 4	
5.30	5146.500	0.00	5145.860
8.30	5144.820	4.50	5145.885
11.30	5143.010	7.50	5143.130
13.80	5142.820	12.50	5142.680
15.30	5142.470	14.00	5141.750
16.30	5142.610	15.50	5142.710
19.10	5141.780	20.50	5143.200
21.30	5143.040	23.50	5146.010
23.30	5144.720	28.50	5146.040
25.30	5146.160		
Cross Section 2		Cross Section 5	
4.80	5146.210	1.50	5145.870
6.30	5146.610	6.00	5142.640
9.30	5142.590	9.00	5141.590
13.30	5141.750	11.50	5140.900
17.30	5141.620	15.00	5141.340
21.30	5141.860	19.00	5143.660
22.70	5143.770	22.00	5146.020
23.80	5145.710		
Cross Section 3			
4.10	4146.110		
8.60	5141.950		
12.30	5141.480		
12.30	5141.150		
16.90	5141.950		
19.40	5142.935		
22.80	5144.970		
23.30	5146.230		

APPENDIX A-1.2.4

Channel Reach Survey Procedure

APPENDIX A-1.2.4 CHANNEL REACH SURVEYS

Vertical control was established by referencing to an existing temporary bench mark (TBM) located at or near each structure. Each TBM is permanently secured such that additional or future surveys can be referenced to the same elevation. The need to do additional surveying may arise as a result of flooding which could cause changes in channel geometry, from aggredation or degradation of the stream channel bottom as a result of increased or decrease sediment transport, and from modifications or changes in the control structure, staff location or staff elevation.

Each stream cross section was referenced either to the TBM or an established pin at the nearest upstream or downstream cross section to maintain vertical control. All rod readings were recorded to the nearest 0.005 feet. For each surveying instrument location, a backsight and foresight to established pins was recorded. All level loops were closed on the original TBM at each location, with an allowable vertical closure error not-to-exceed 0.01 feet. An end-to-end test or "peg test" was conducted on the surveying instrument each day prior to use to ensure instrument accuracy.

Horizontal control was established by driving 5/8-inch rebar stakes (pins) at the endpoints of each cross section. The pins serve as reference locations for each cross section and may be used for future surveys, if required. Each pin was tagged with aluminum tags etched with the station identification, pin identification and date. Pins were positioned on both sides of the stream channel perpendicular to flow lines in the stream. The location of the pins is high enough such that a wide range of high flows will be contained within the surveyed cross sections. Each pin was hammered into the ground approximately 1.5 feet. The remaining 0.5 feet was painted orange and tagged with orange surveyor's flagging for ease of locating in the future. For step-backwater modeling purposes, baseline and azimuth measurements were not required. Since all cross sections were staked and identified, horizontal control with reference to magnetic north can easily be obtained by additional surveys.

All cross sections were surveyed from left to right looking in a downstream direction. Horizontal stations were determined to the nearest 0.1 feet using a cloth tape stretched between the pins. Horizontal stationing was determined for all slope breaks along each cross section, for the left and right overbank reaches, left and right channel banks, left and right edge of water and for the thalweg of each cross section. Additionally, the water surface elevation at each cross section were determined to compute the energy grade of a particular reach.

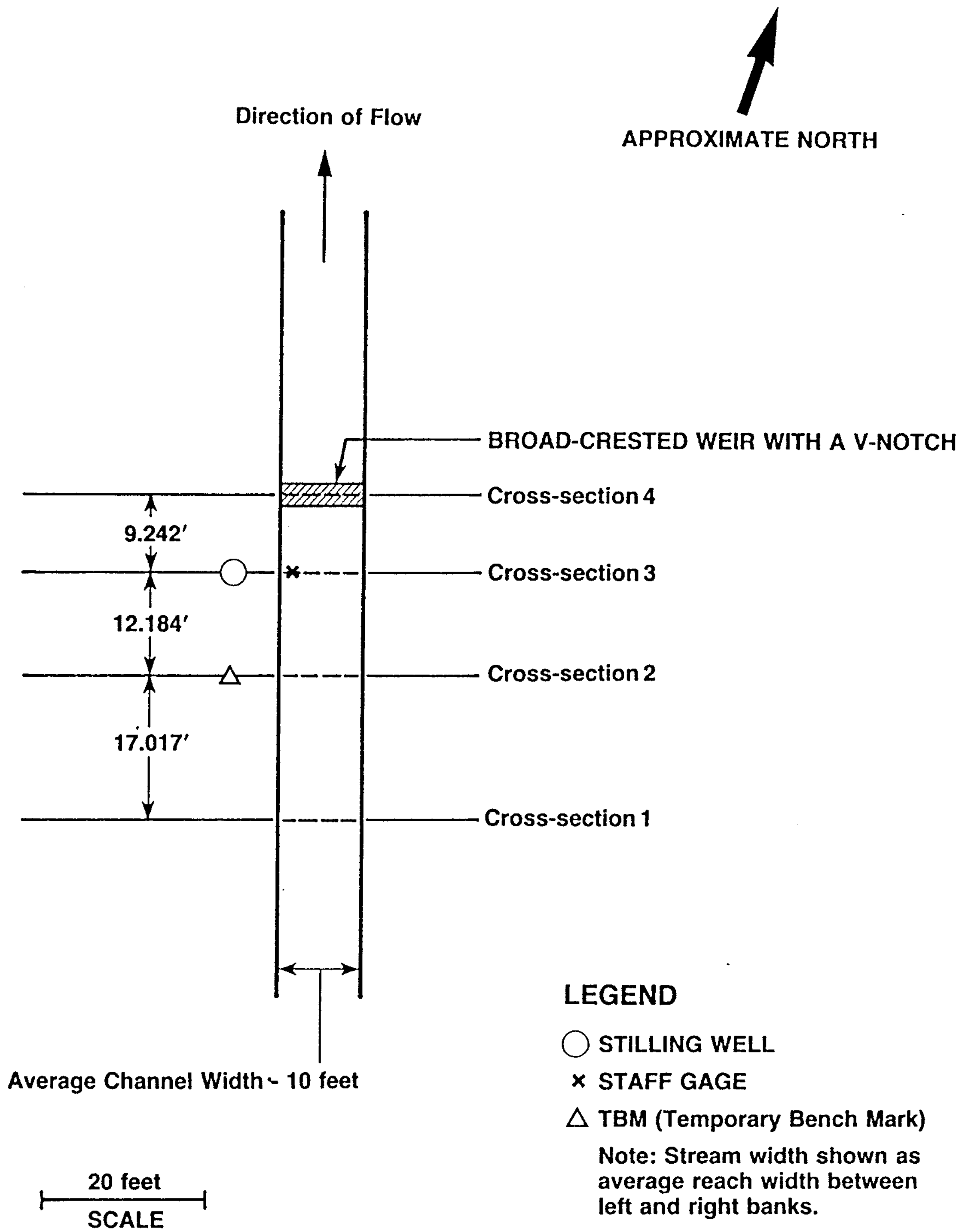

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Figure A-1.2.2-1

North Uvalda (SW01001)
Cross-Section Locations

CMP SW FY89

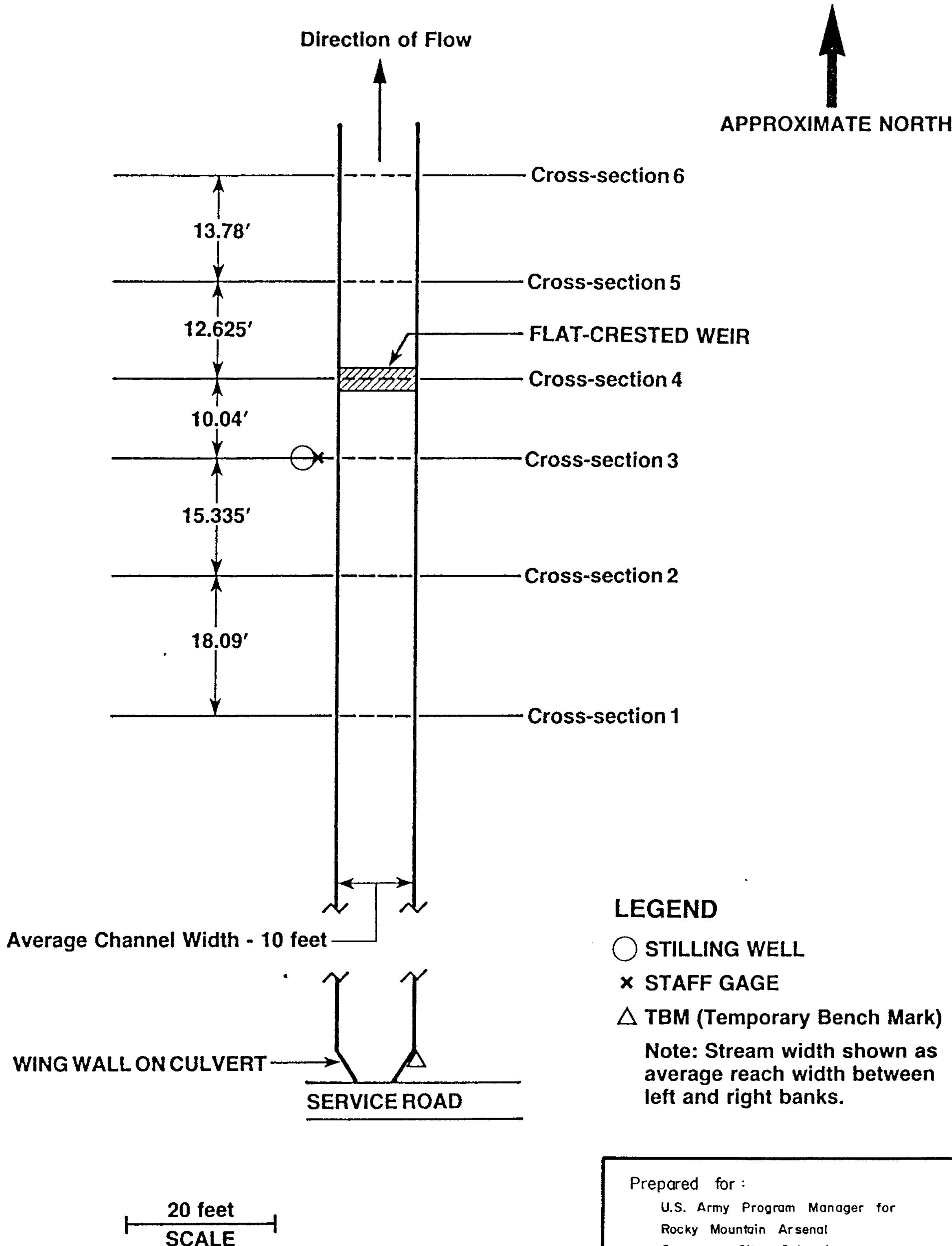

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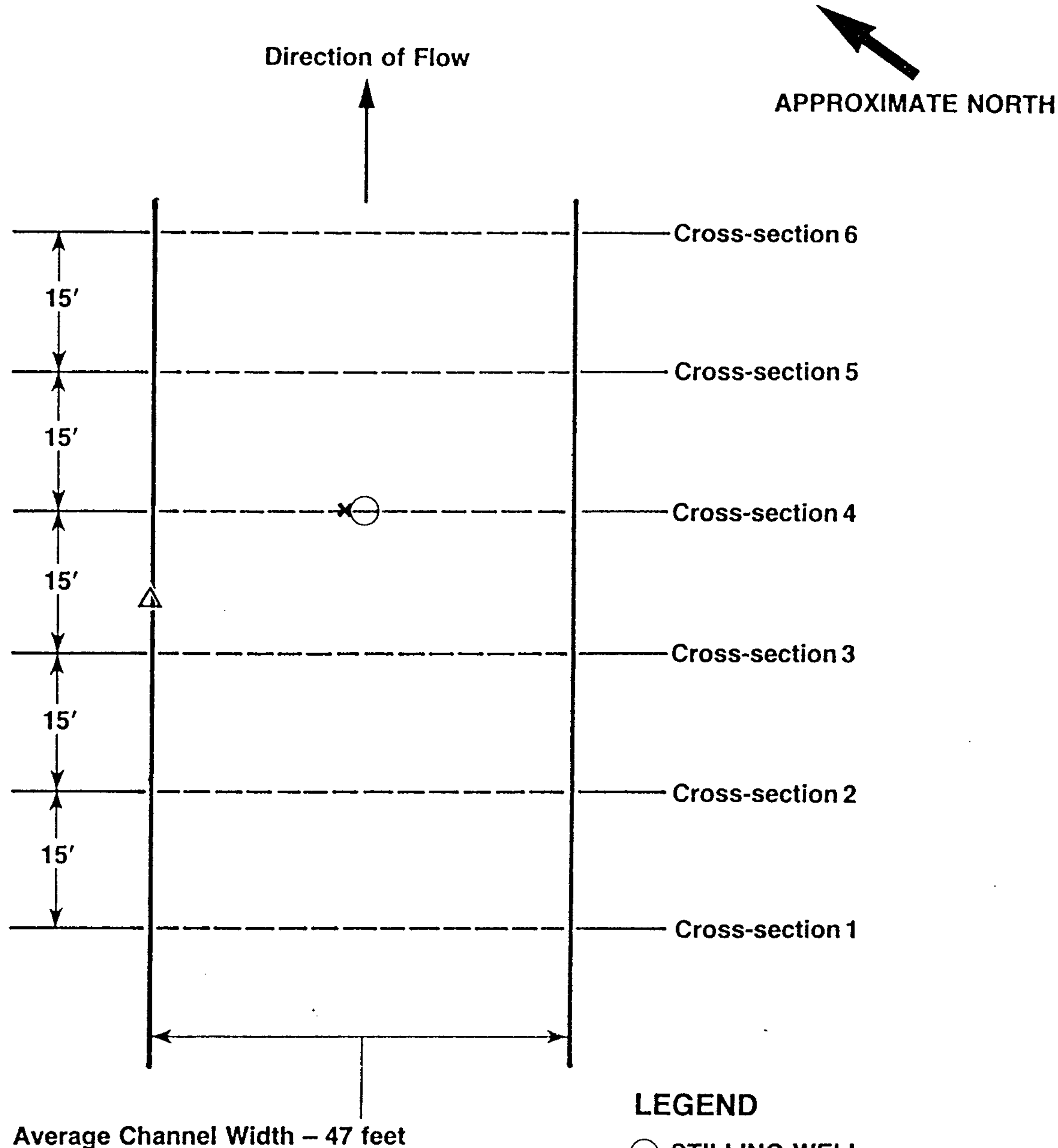
Figure A-1.2.2-2

Peoria Interceptor
(SW11001)
Cross-Section Locations

CMP SW FY89



20 feet
SCALE

LEGEND

- ○ STILLING WELL
- × STAFF GAGE
- △ TBM (Temporary Bench Mark)

Note: Stream width shown as average reach width between left and right banks.

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Figure A-1.2.2-3
Havana Interceptor
(SW11002)
Cross-Section Locations

CMP SW FY89

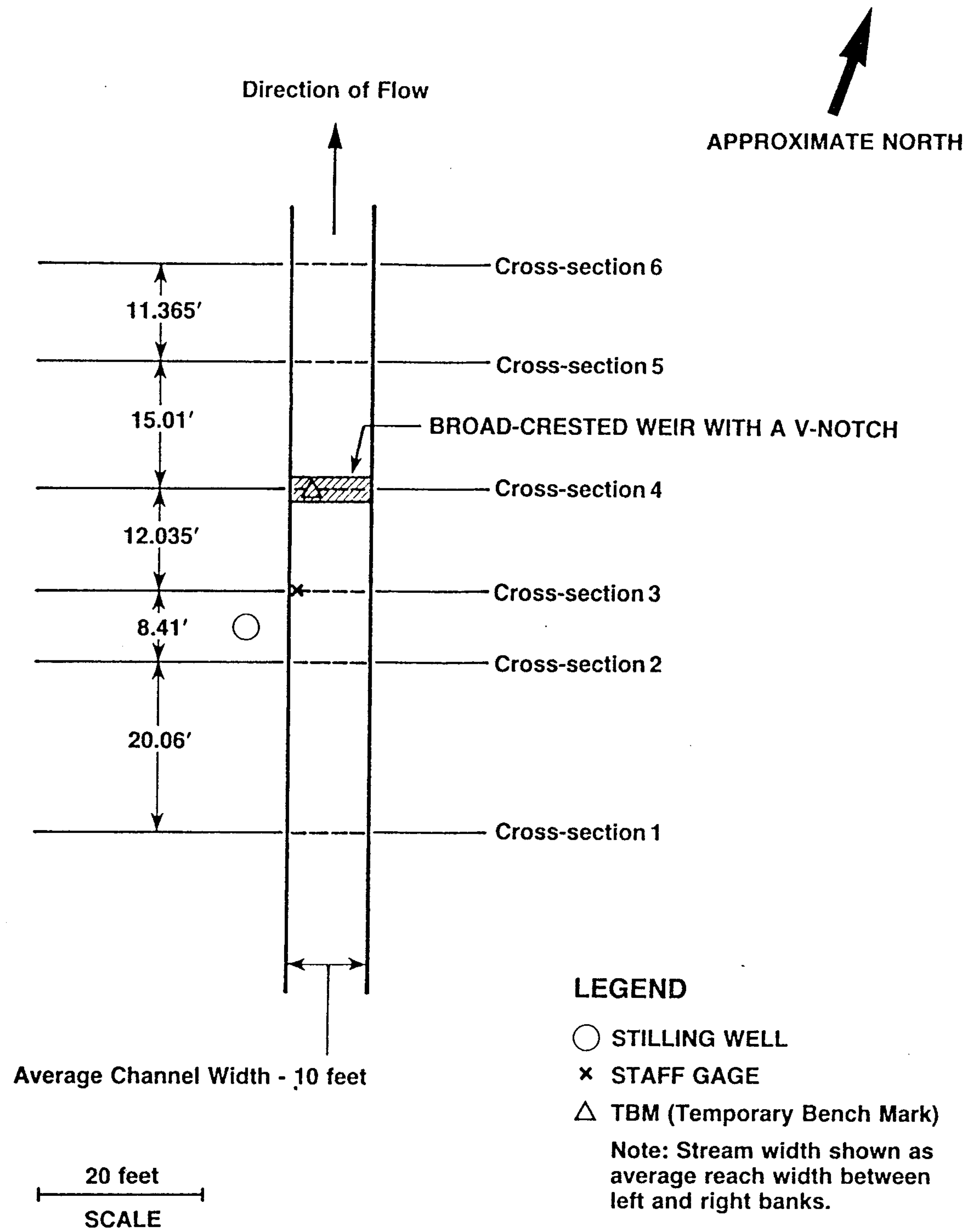

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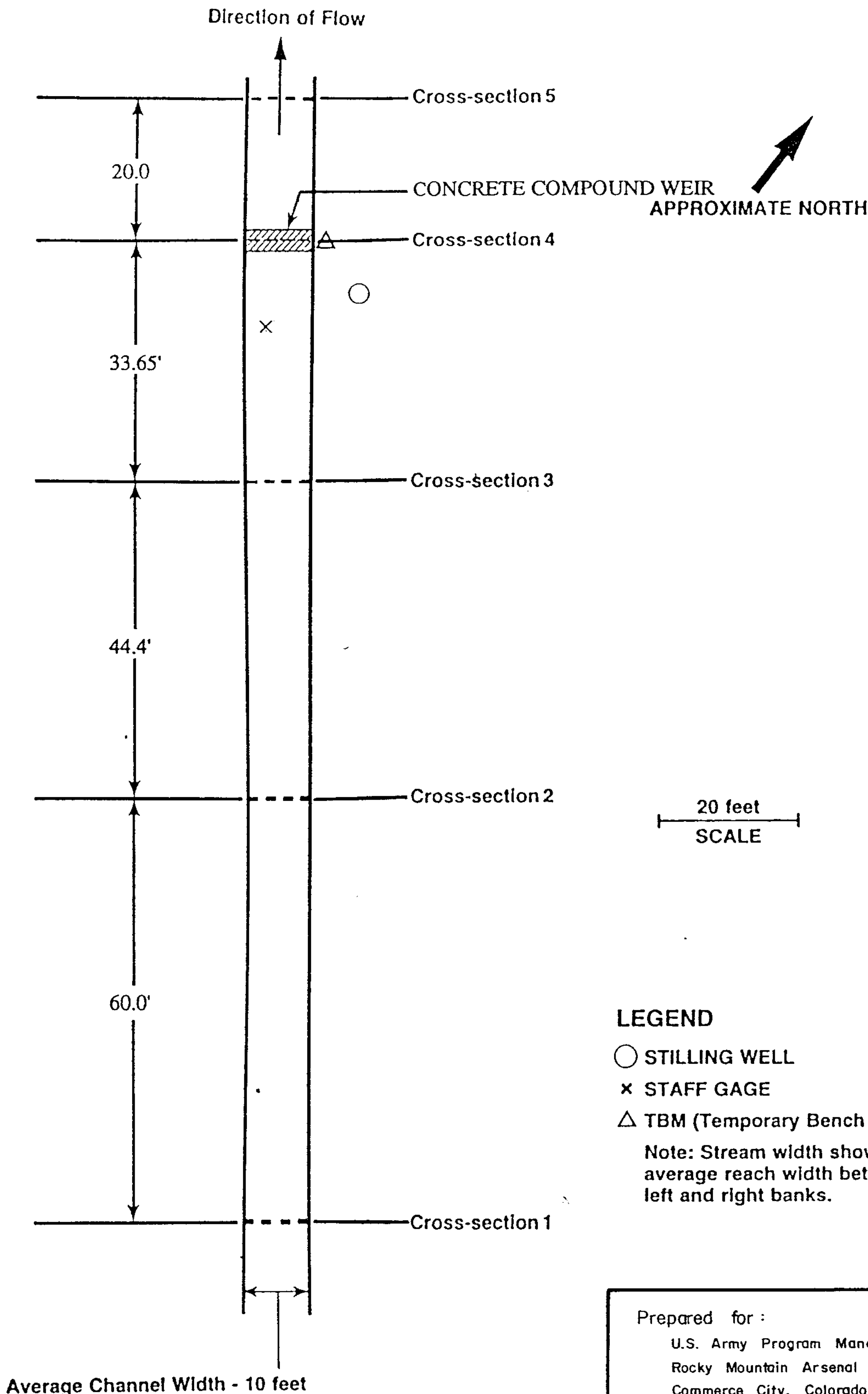
Figure A-1.2.2-4

South Uvalda (SW12005)
Cross-Section Locations

CMP SW FY89



LEGEND

○ STILLING WELL

× STAFF GAGE

△ TBM (Temporary Bench Mark)

Note: Stream width shown as average reach width between left and right banks.

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Figure A-1.2.2-5

North First Creek (SW24002) Cross-Section Locations

CMP SW FY89

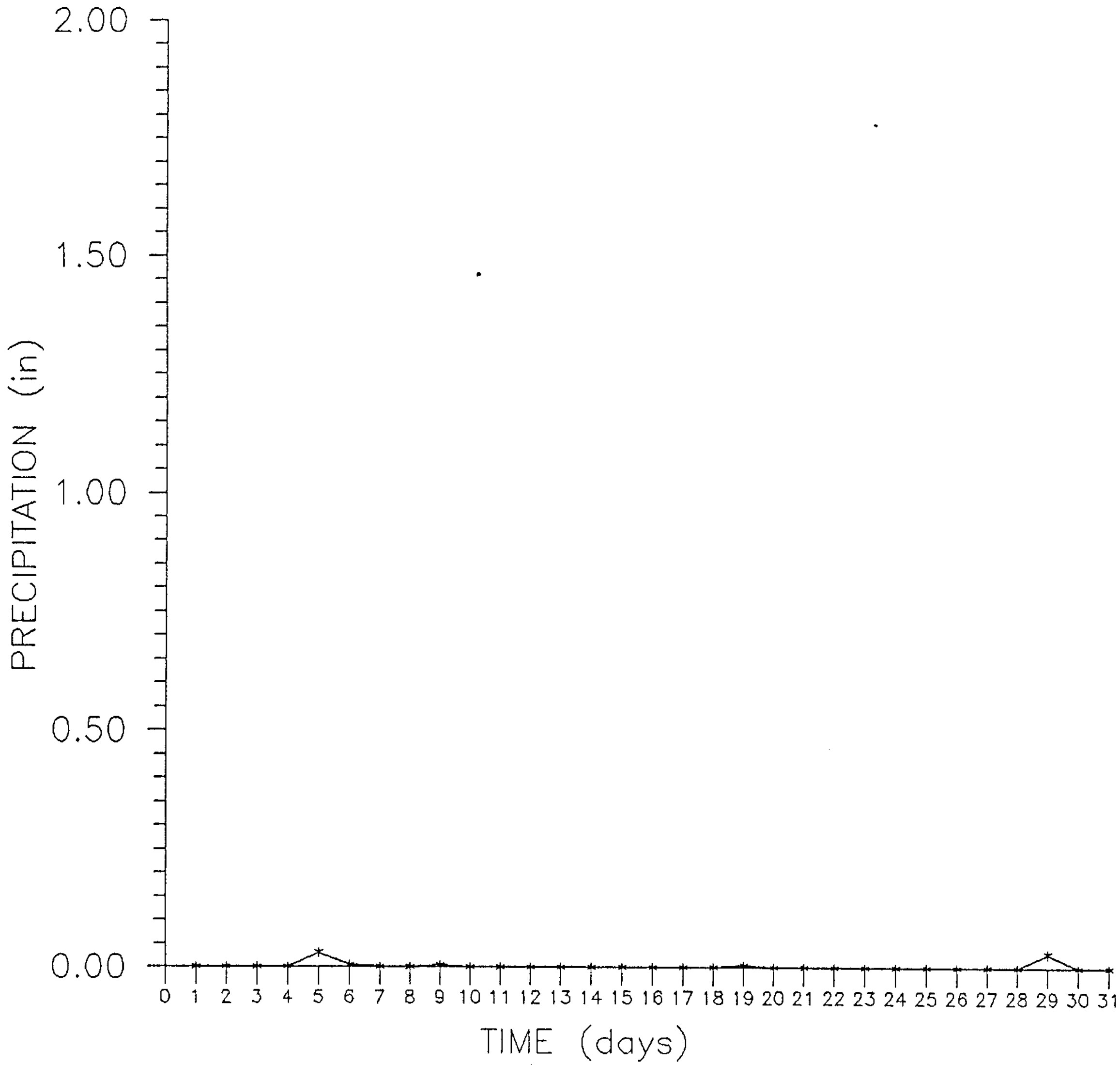

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Figure **A-11.1-1**

October 1988 Precipitation

CMP SW FY89

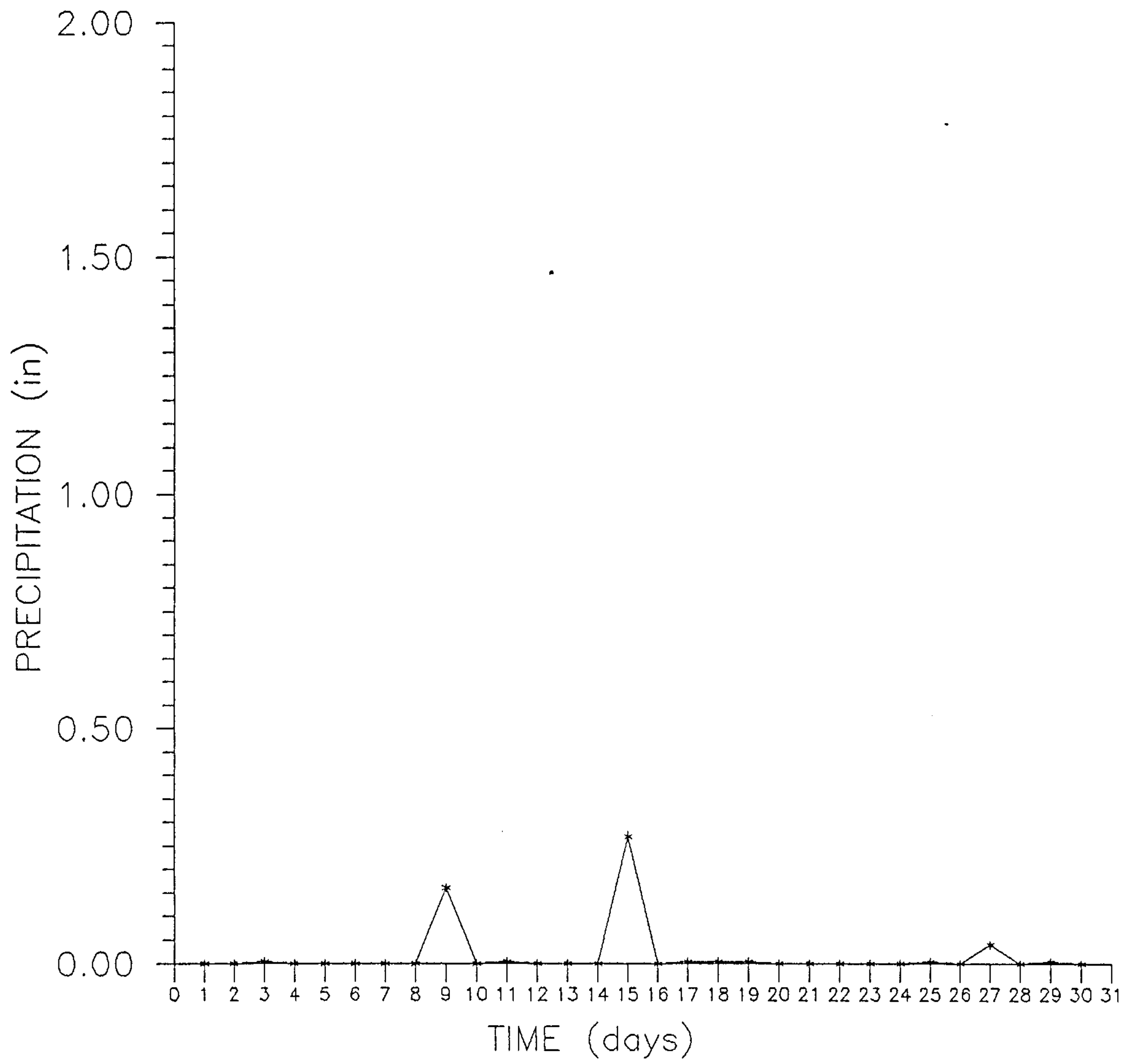

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Figure **A-11.1-2**

November 1988 Precipitation

CMP SW FY89

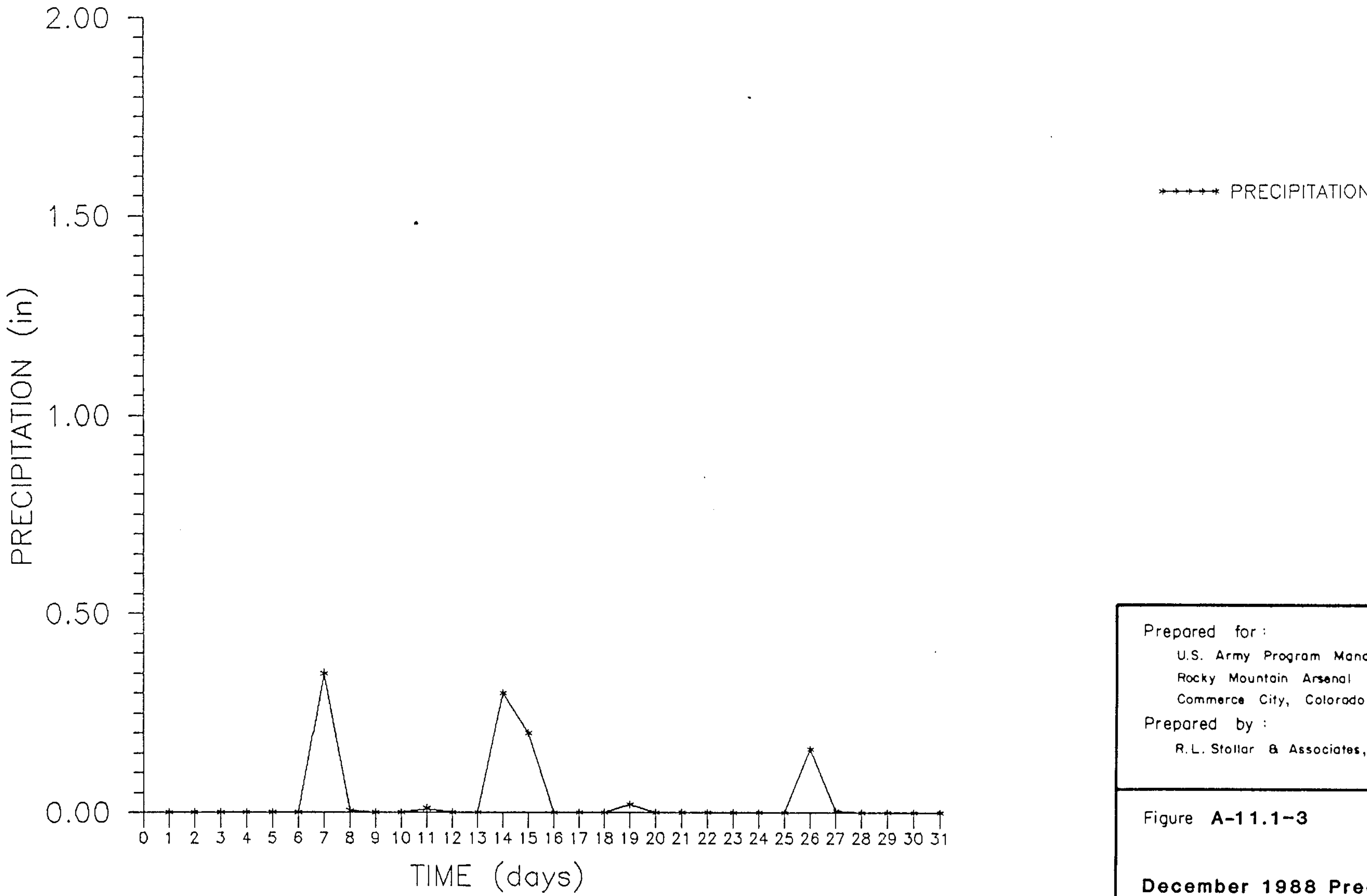

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Figure **A-11.1-3**

December 1988 Precipitation

CMP SW FY89

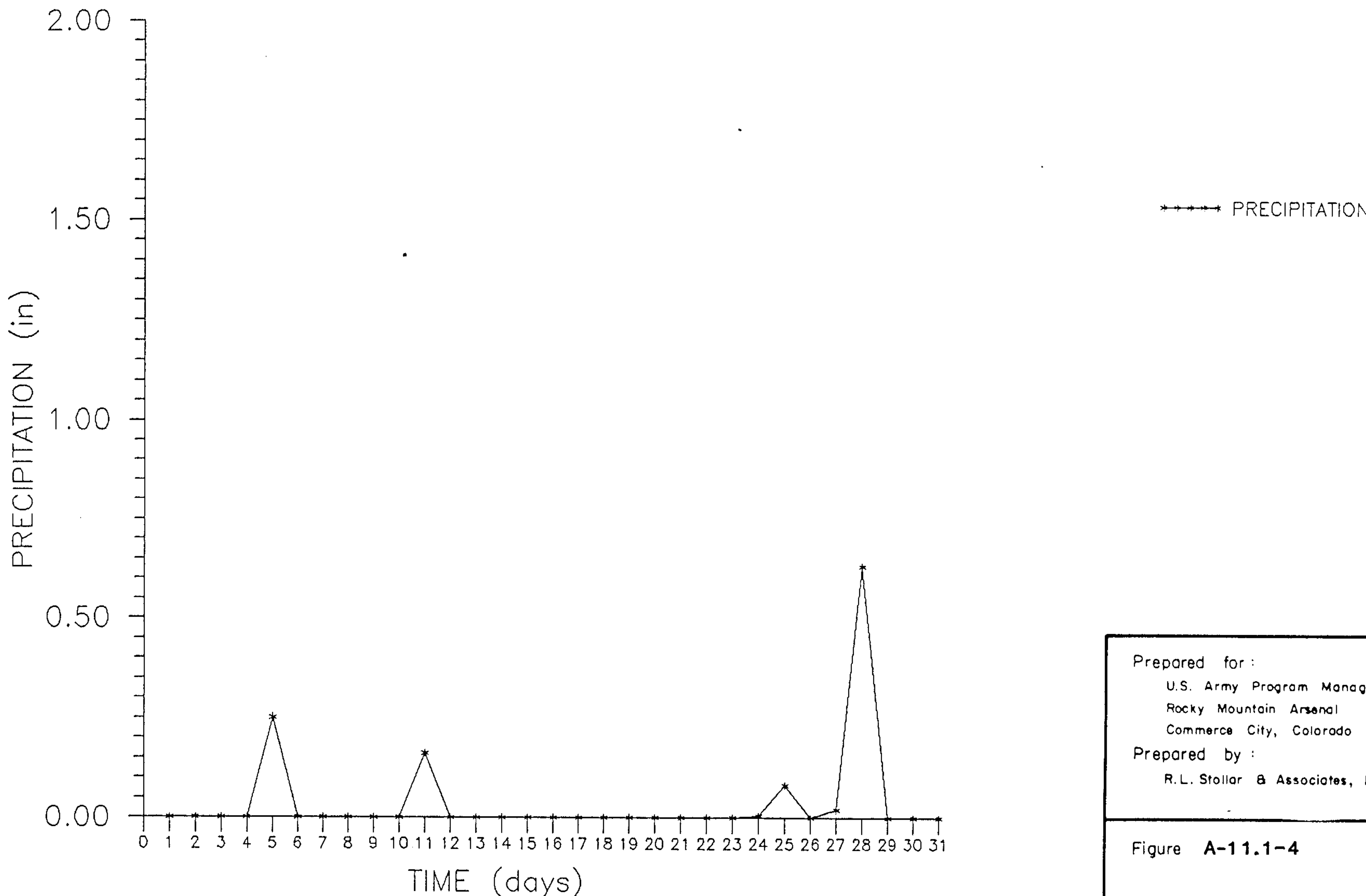

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Figure **A-11.1-4**

January 1989 Precipitation

CMP SW FY89

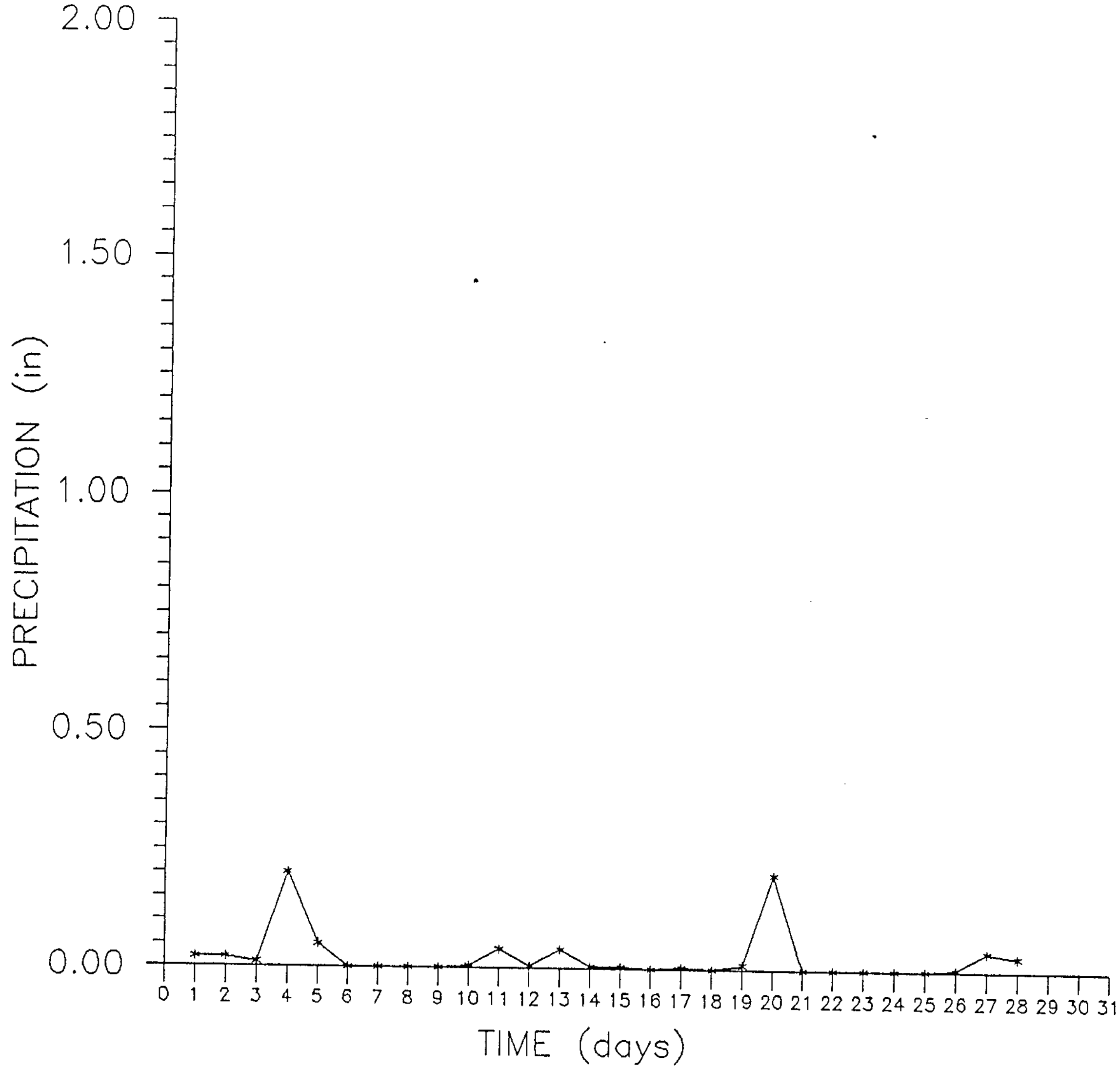

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Figure **A-11.1-5**

February 1989 Precipitation

CMP SW FY89

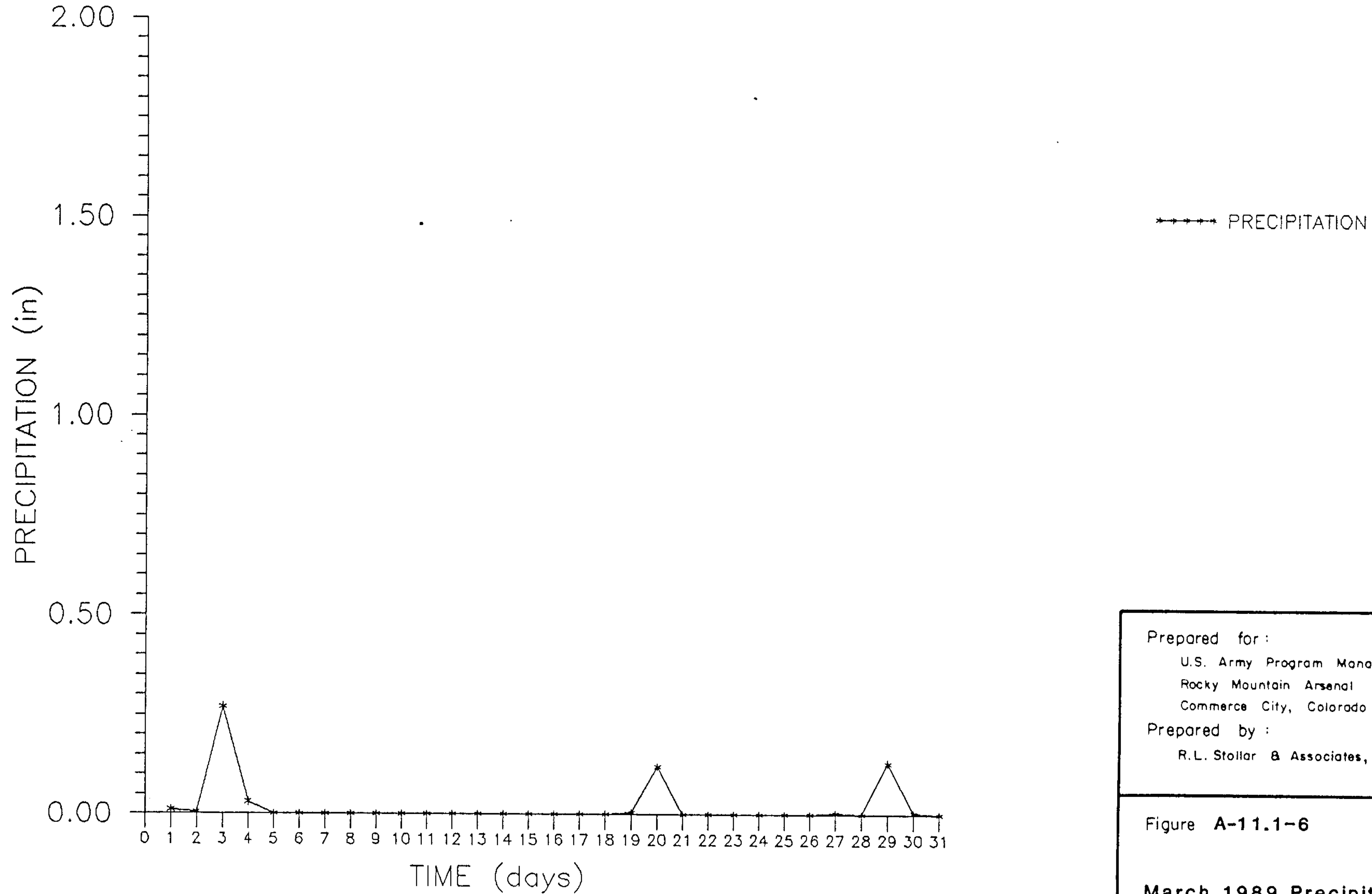

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Figure **A-11.1-6**

March 1989 Precipitation

CMP SW FY89

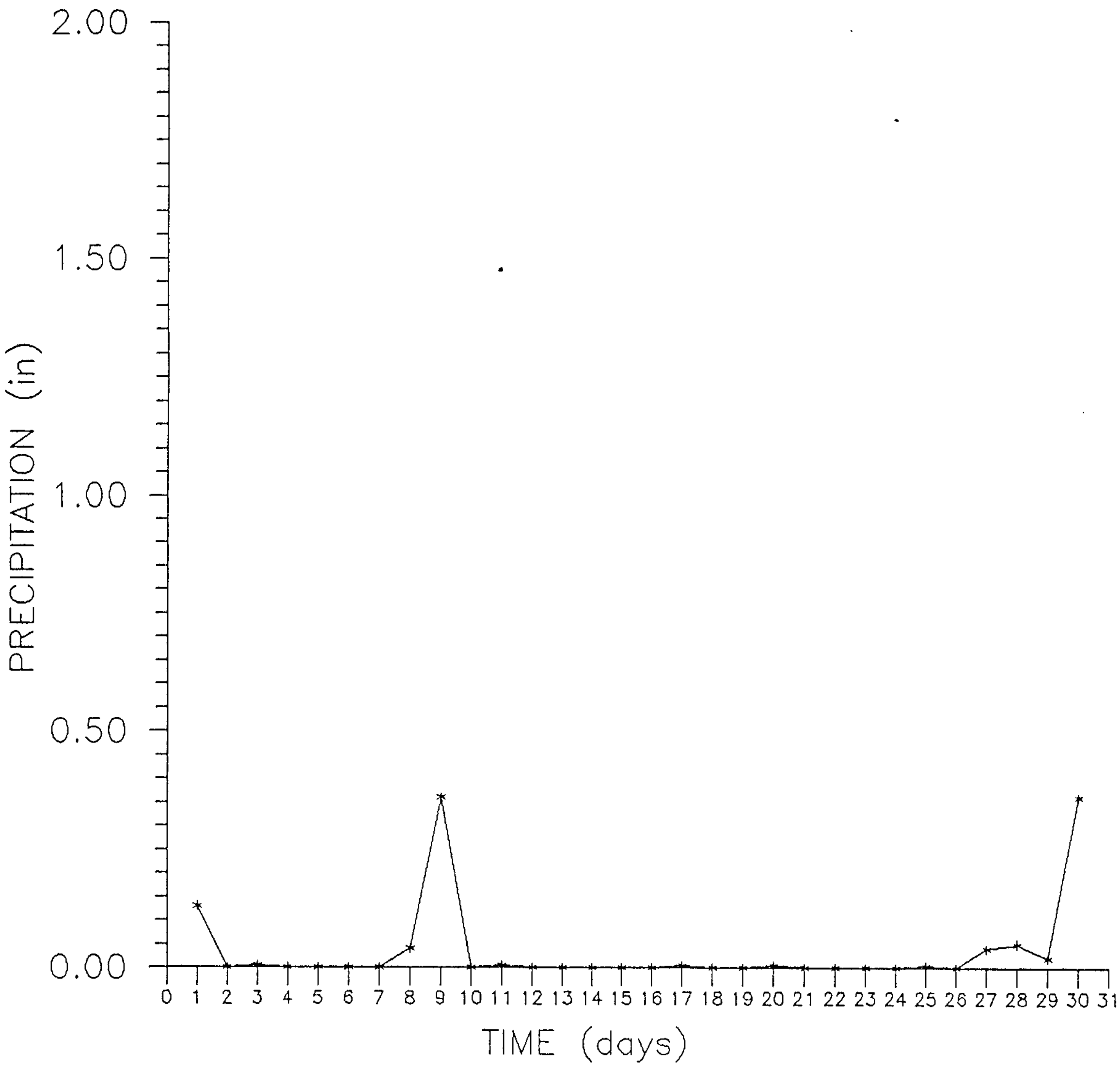

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Figure **A-11.1-7**

April 1989 Precipitation

CMP SW FY89

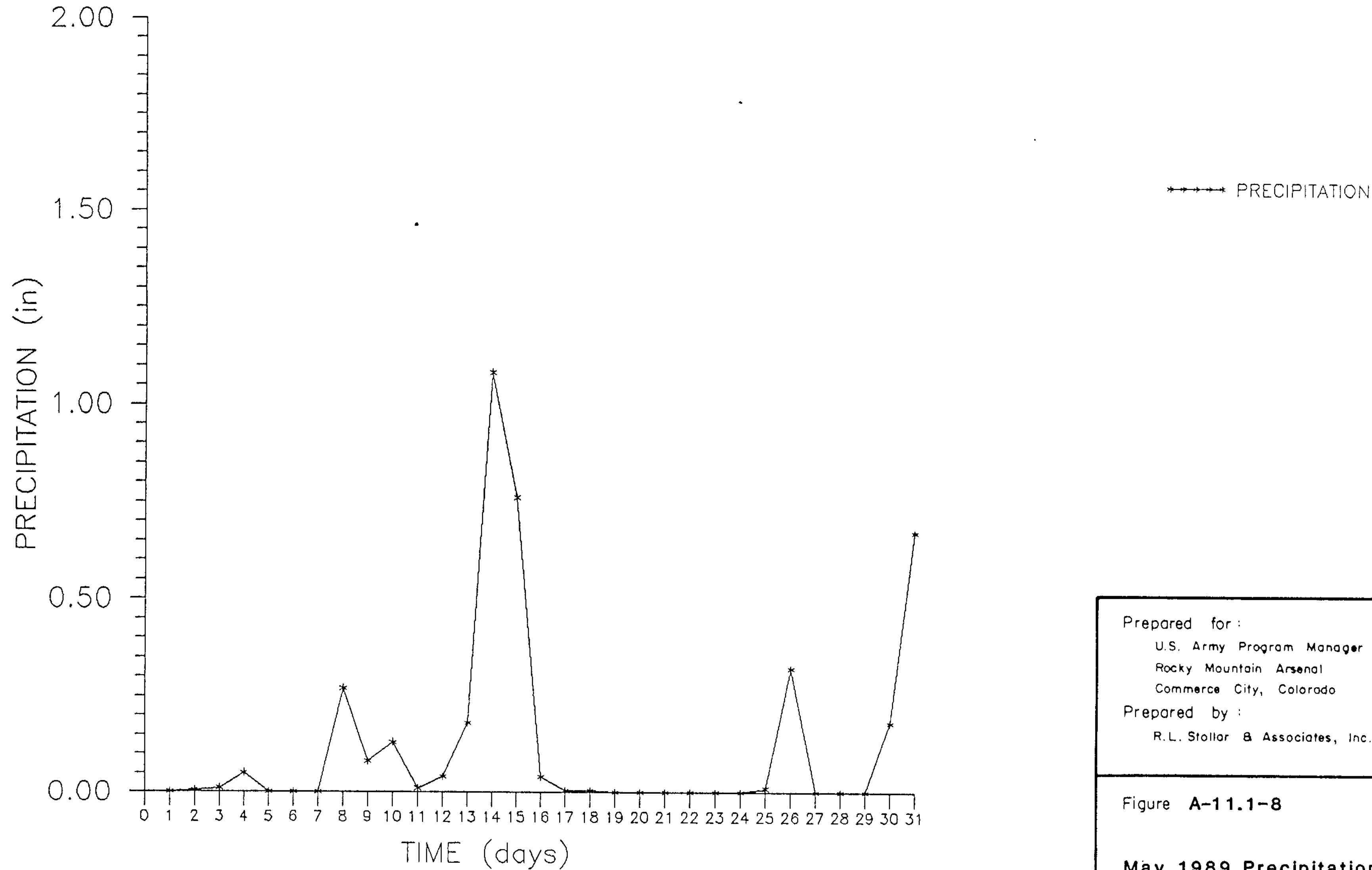

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Figure **A-11.1-8**

May 1989 Precipitation

CMP SW FY89

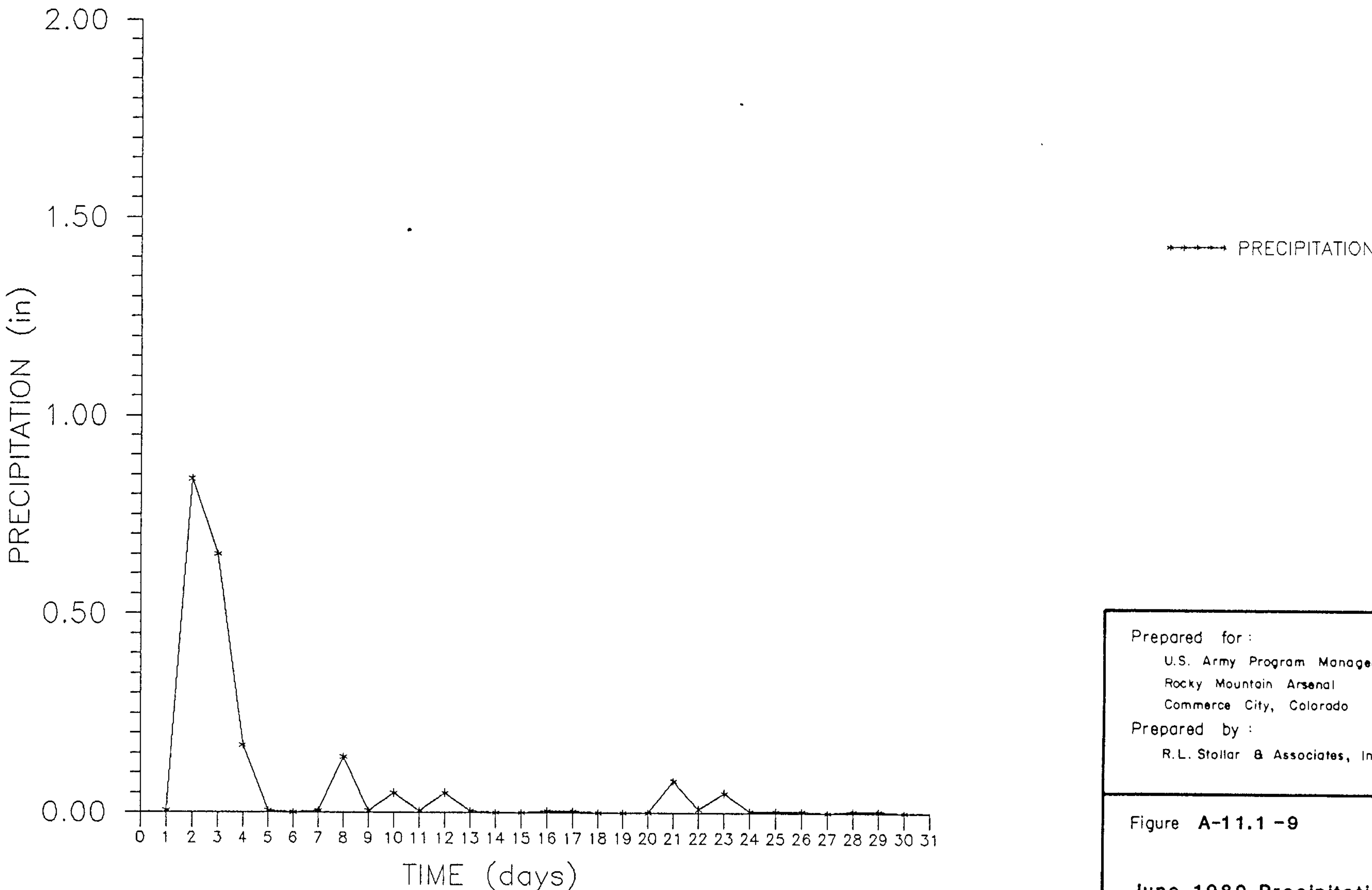

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Figure **A-11.1 -9**

June 1989 Precipitation

CMP SW FY89

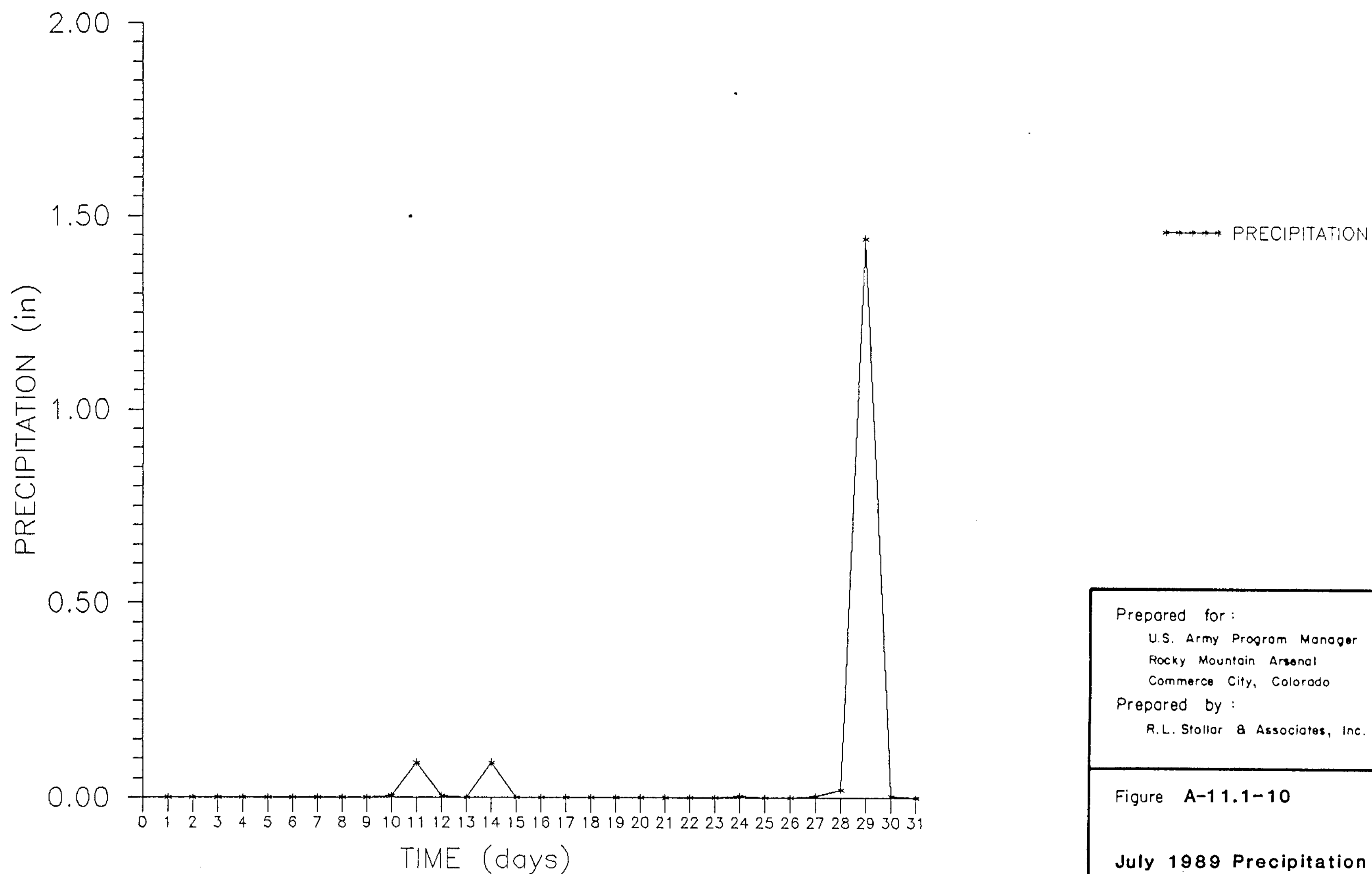

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Figure **A-11.1-10**

July 1989 Precipitation

CMP SW FY89

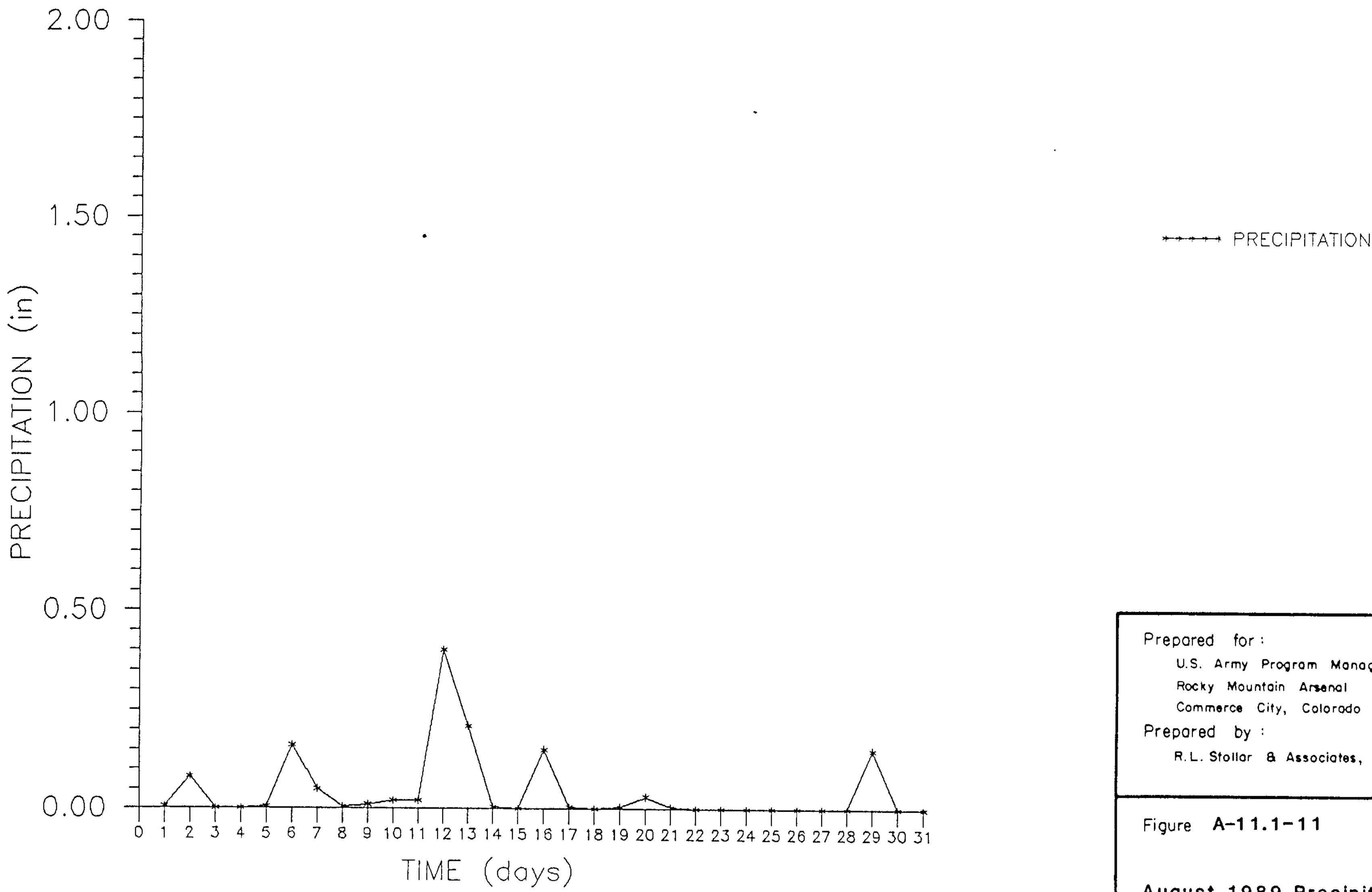

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Figure **A-11.1-11**

August 1989 Precipitation

CMP SW FY89

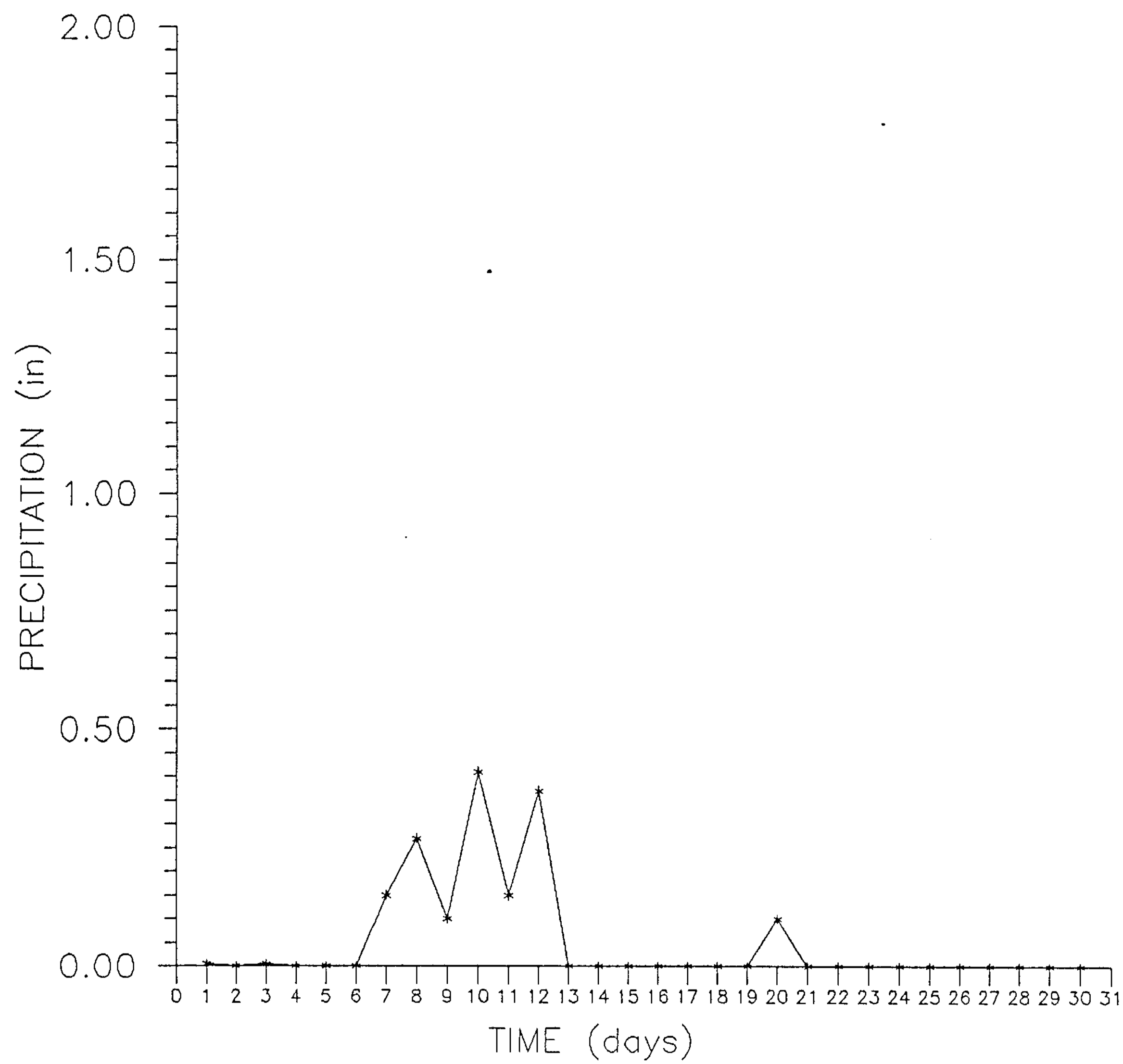

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Figure **A-11.1-12**

September 1989 Precipitation

CMP SW FY89

APPENDIX A-2

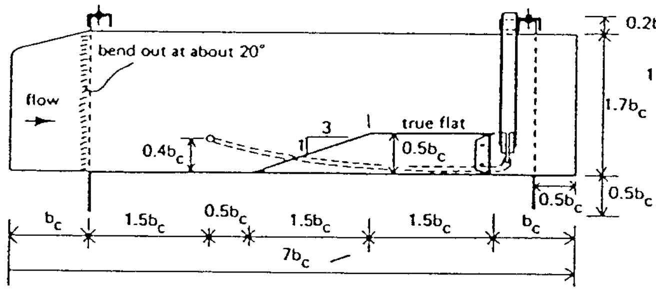
Instantaneous Discharge Measurements

APPENDIX A-2.1

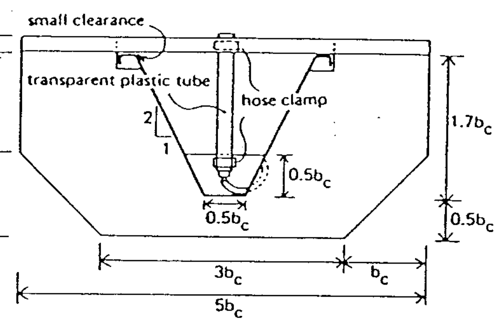
Flume Specifications

VIEWS

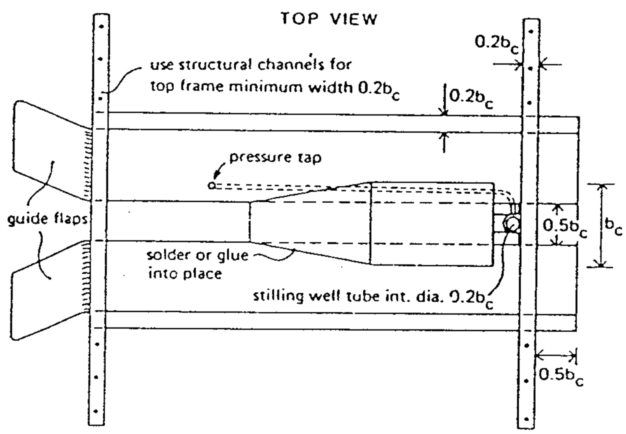
LONGITUDINAL SECTION



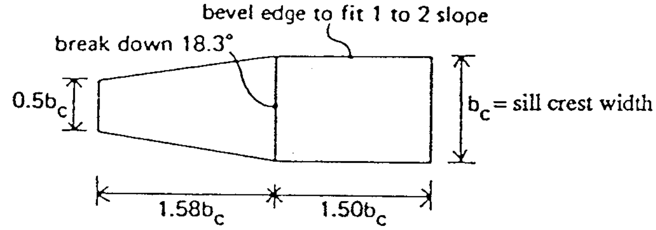
END VIEW



TOP VIEW



TOP VIEW SILL DETAIL



100 mm Flume	200 mm Flume
b_c = 100 mm = 3.94 in	b_c = 200 mm = 7.87 in

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Figure A-2.1-1
100mm and 200mm
Long-Throated Flume
Specifications
CMP SW FY89

Appendix A-2.1

Table 2.1-1 Stage Discharge Relationship for 100 mm Portable Long-throated

h (ft)	Q (cfs)
0.04	0.0078
0.05	0.0113
0.06	0.0153
0.07	0.0198
0.08	0.0247
0.09	0.0301
0.10	0.0360
0.11	0.0424
0.12	0.0492
0.13	0.0565
0.14	0.0643
0.15	0.0726
0.16	0.0814
0.17	0.0907
0.18	0.1004
0.19	0.1107
0.20	0.1214
0.21	0.1327
0.22	0.1445
0.23	0.1568
0.24	0.1697
0.25	0.1831
0.26	0.1970
0.27	0.2114
0.28	0.2264
0.39	0.2420
0.30	0.2582
0.31	0.2748
0.32	0.2921
0.33	0.3099

(1) Design and ratings taken from "Flow Measuring Flumes for Open Channel Systems"; Marinus G. Bos, John A. Repogle, Albert J. Clemmens, 1984 by John Wiley & Sons, Inc.

(2) "h" is upstream sill - referenced head.

Appendix A-2.1

Table 2.1-2 Depth Discharge Relationship for Long-throated Portable Flume with 0.66 ft (200 mm) wide sill (1)

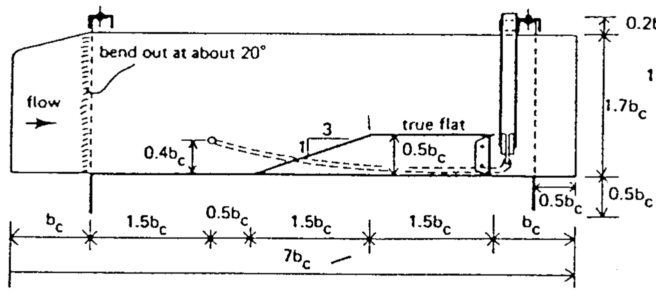
h (ft)	Q (cfs)	h (ft)	Q (cfs)
0.07	0.0367	0.37	0.6008
0.08	0.0456	0.38	0.6303
0.09	0.0552	0.39	0.6606
0.10	0.0655	0.40	0.6915
0.11	0.0765	0.41	0.7232
0.12	0.0883	0.42	0.7557
0.13	0.1007	0.43	0.7887
0.14	0.1137	0.44	0.8226
0.15	0.1275	0.45	0.8572
0.16	0.1419	0.46	0.8927
0.17	0.1570	0.47	0.9288
0.18	0.1727	0.48	0.9656
0.19	0.1891	0.49	0.9656
0.20	0.2062	0.50	1.042
0.21	0.2240	0.51	1.081
0.22	0.2424	0.52	1.121
0.23	0.2615	0.53	1.161
0.24	0.2813	0.54	1.203
0.25	0.3017	0.55	1.245
0.26	0.3229	0.56	1.288
0.27	0.3447	0.57	1.332
0.28	0.3672	0.58	1.376
0.29	0.3903	0.59	1.422
0.30	0.4142	0.60	1.468
0.31	0.4387	0.61	1.515
0.32	0.4640	0.62	1.563
0.33	0.4900	0.63	1.611
0.34	0.5167	0.64	1.661
0.35	0.5440	0.65	1.711
0.36	0.5721	0.66	1.762

(1) Design and ratings taken from "Flow Measuring Flumes for Open Channel Systems"; Marinus G. Bos, John A. Repogle, Albert J. Clemmens, 1984 by John Wiley & Sons, Inc.

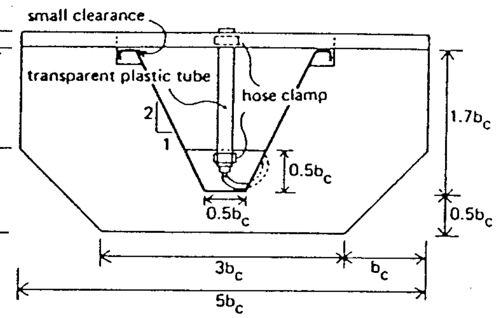
(2) "h" is upstream sill - referenced head.

VIEWS

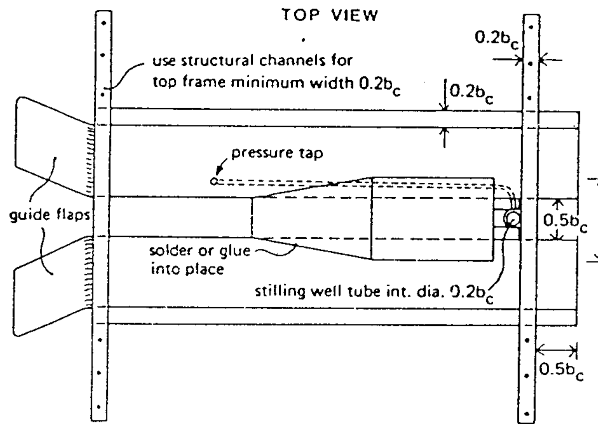
LONGITUDINAL SECTION



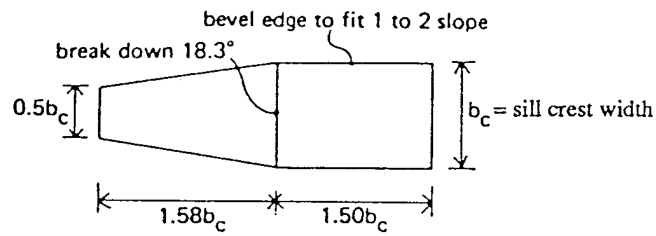
END VIEW



TOP VIEW



TOP VIEW SILL DETAIL



100 mm Flume	200 mm Flume
$b_c = 100$ mm = 3.94 in	$b_c = 200$ mm = 7.87 in

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U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by :
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Riverside Technology, Inc.

Figure A-2.1-1
100mm and 200mm
Long-Throated Flume
Specifications

CMP SW FY89

APPENDIX A-2.2

Discharge Measurement Procedures

A-2.2 Pygmy and Type-AA Current Meter Discharge Measurement Procedure

The following details procedure methods used in performing an instantaneous discharge measurement using pygmy or Type-AA current meters.

The calibration check for the Pygmy and Type-AA current meters are as follows:

- the rotor and shaft alignment was checked by spinning the bucket wheel;
- the cups were checked for damage and bending;
- the Type-AA tailpiece condition was checked; and
- a spin test was performed to check the condition of the bearing and record. A normal Type-AA meter spin test should never have been less than 1 1/2 minutes. The normal spin for a Pygmy meter should never have been less than 1/2 minute.

The Marsh-McBirney current meter is a factory calibrated electromagnetic-type meter and cannot be adjusted in the field. However, the battery, the electromagnetic sensor and internal electrical circuitry was checked. In addition the above field inspection procedures, each meters' manufacturer suggested instructions for routine care and maintenance was followed.

The following procedures were implemented to measure and calculate current meter instantaneous discharge rates:

- A measuring tape was stretched across the stream at right angles to the direction of flow to determine the width of the stream and to be used in the measurement of each flow cell.
- The spacing of the subsections (flow cells) was generally made by dividing the total width of the stream into 20 subsections. Sections were usually chosen so that no section contained more than 10 percent of the total flow. Equal widths (subsections) across a cross section were used unless the discharge was well distributed. For RMA where 20 sections were not usually possible a minimum distance of 0.3 feet between subsections was generally used.
- Recording stream stage from the staff gage and the recorder (if present). Identifying the starting point by either LEW or REW (left edge of water or right edge of water, respectively, when facing downstream). Recording the starting time on the

measurement sheet and on the recorder (if present). Recording the staff gage periodically during measurement and time in order to determine the mean gage height for the measurement.

- Recording the distance from the initial measuring point to the edge of water and the depth at the edge of water.

- For stream depths encountered during WY88, measurements were made at 0.6 depth using a top setting wading rod. This rod is masked so as to automatically suspend the current meter at 0.6 depth by "setting" the total depth on the wading rod.

- After the meter was set at the proper depth, it was allowed to stabilize to the stream current. The wading rod was kept in a vertical position and the current meter was held parallel to the direction of flow. The hydrologist stood in a position that least affected the velocity of the water passing the current meter by standing downstream and off to one side of the rod.

- The measuring and recording of flow velocity using the Pygmy or Type-AA meters was performed in accordance with the manufacturer's instructions. The minimum time for measuring velocity in each subsection was 40 seconds. A headphone set was wired into the meters and a click was heard in the headphones that corresponded to each meter revolution. The number of revolutions was recorded for each 40 second time interval. The velocity for each subsection was either calculated or obtained from the meter manufacturer's table for the numbered revolutions per 40 seconds. Marsh-McBirney meter measurements were obtained from the direct digital display on the instrument.

- The remaining stream flow measurement was obtained by moving to each of the verticals and repeating the process. Upon completion of the measurement the time and bank where the section ended and the stream staff gage and recorder water level was recorded on the discharge measurement sheet.

- The description of the stream bed, flow conditions, location of the measurement, weather and any other pertinent information which may have affected the accuracy of the measurement or the stage discharge relationship was recorded on the discharge measurement sheet.

- A field calculation that added the section widths, totalled the section widths and computed the discharge was performed.

Long-Throated Flume Discharge Measurement Procedure

Instantaneous discharge measurements are taken using either the 100mm or 200mm long-throated flumes depending on stream stage and flow conditions. The 100mm flume is capable of measuring flows ranging from 0.0078 cfs to 0.3099 cfs, and the 200mm flume is capable of measuring flows ranging from 0.0367 cfs to 1.762 cfs.

Both flumes are custom built, galvanized sheetmetal rated structures. A water intake port in the flume channel is hydraulically connected to a clear plastic stilling well that is attached to the structure. The water level in the flume channel is measured as hydraulic head in the stilling well. The structures are mathematically rated, which enables a conversion of the measured hydraulic head to a corresponding discharge.

Procedures for obtaining instantaneous discharge measurements with either the 100mm or 200mm long-throated flumes are as follows:

- Select a site in the channel for the flume. This site should be in a reach of the channel that is straight both upstream and downstream of the flume site. The channel shoud be free of obstructions and have uniform flow.

- Record gage height (if available) and time in the log book and on the data sheet.

- Prepare the channel at the flume site by removing any rocks or debris which will interfere with leveling and sealing of the flume during installation.

- Install the flume in the channel making sure the flume is stable and level. Leveling of the cross-slope and longitudinal slope may be done with a carpenter's level.

- Seal the bottoms and sides of both the upstream and downstream faces of the wingwalls of the flume with soil. The flume must be completely sealed so that all flow is diverted through the flume for an accurate measurement.

- Allow the flow to stabilize over the sill of the flume. Check for leaks around the edges and bottom of the flume and seal if necessary.

- Obtain the sill-referenced head by measuring the distance from the top of the sill to the water level inthe stilling well with a metal tape measure.

- For each size of flume, a rating table was prepared (see stage discharge relationship

tables). Using the proper rating table, find the h value, in feet, and record the corresponding discharge value, in cfs. The head, discharge, time and gage height (if available) are recorded in the log book and on the data sheet. Generally, there are three discharge measurements taken at five minute intervals at each site.

APPENDIX A-2.3

1989 Water Year Instantaneous
Discharge Measurement Records

WY89 Discharge Measurements Summary

APPENDIX A-2.3 TABLE A-2.3-1
SUMMARY OF DISCHARGE MEASURMENTS FOR MONITORING STATIONS

SITE ID#	SITE NAME	DATE	INSTRUMENT TYPE	DISCH (CFS)	STAGE (FT) START/STOP	COMMENTS LOCATION
SW01001	N. UVALDA	89269	FLUME-100MM	0.03	0.19	STAGE CONVERTED TO DISCHARGE
SW02006	STEAM PLANT	89117	FLUME-200MM	0.34	NA	EVEN WITH SURVEY STK
	EFFLUENT	89167	FLUME-100MM	0.09	NA	EVEN WITH SURVEY STK
		89201	FLUME-100MM	0.06	NA	EVEN WITH SURVEY STK
		89270	FLUME-100MM	0.11	NA	10FT UP STAKE
SW07001	UVALDA DITCH A	89268	FLUME-100MM	0.06	NA	
SW07002	UVALDA DITCH B	89268	FLUME-100MM	0.17	NA	
SW08001		89272	FLUME-100MM	0.14	NA	1100' ABOVE SW08003
SW08003	S FIRST CREEK	89097	PYG CURRENT METER	0.59	0.49	25FT BELOW GAGE
		89102	PYG CURRENT METER	1.06	0.58/0.57	43FT BELOW GAGE
		89115	FLUME-200MM	0.72	0.47	40FT BELOW GAGE
		89123	FLUME-200MM	0.86	0.50	40FT BELOW GAGE
		89125	PYG CURRENT METER	9.23	1.23/1.22	40FT BELOW GAGE
		89134	NA	6.40	1.10	CALCULATED FROM STAGE
		89171	FLUME-200MM	0.69	0.48	30FT BELOW GAGE
		89201	FLUME-100MM	0.01	0.13	30FT BELOW GAGE
		89269	FLUME-100MM	0.10	0.22	30FT BELOW GAGE
		89272	FLUME-100MM	0.06	0.20	30FT BELOW WEIR
SW08004		89272	FLUME-100MM	0.04	NA	1400'BELOW SW08003
SW11001	PEORIA INT	89116	FLUME-200MM	0.13	0.72	30FT BELOW WEIR
		89134	NA	14.01	1.56	CALCULATED FROM STAGE
		89201	FLUME-200MM	0.16	0.69	30FT BELOW WEIR
		89270	FLUME-100MM	0.05	0.70	100FT BELOW GAGE
SW11002	HAVANA INT	89101	PYG CURRENT METER	1.46	0.52/0.51	8FT DWNSTR BUBBLER
		89116	PYG CURRENT METER	0.37	0.25	UNDER OLD BRIDGE
		89130	NA	20.87	1.00	CALCULATED FROM STAGE
		89201	FLUME-200MM	0.37	0.23	END OF CONC CHANNEL
		89270	FLUME-200MM	0.49	0.25	END OF CONC CHANNEL

APPENDIX A-2.3 TABLE A-2.3-1
SUMMARY OF DISCHARGE MEASURMENTS FOR MONITORING STATIONS

SITE ID#	SITE NAME	DATE	INSTRUMENT TYPE	DISCH (CFS)	STAGE (FT) START/STOP	COMMENTS LOCATION
SW12001	UVALDA DITCH C	89110	PYG CURRENT METER	0.33	NA	
		89268	FLUME-200MM	0.27	NA	
SW12005	S. UVALDA	89080	PYG CURRENT METER	0.26	3.85	30FT BELOW WEIR
		89080	PYG CURRENT METER	0.30	3.85	30FT BELOW WEIR
		89107	PYG CURRENT METER	0.35	3.80	30FT BELOW WEIR
		89111	FLUME-200MM	0.26	3.84	30FT BELOW GAGE
		89130	NA	4.53	4.58	CALCULATED FROM STAGE
		89171	FLUME-200MM	0.54	3.88	40FT BELOW GAGE
		89269	FLUME-200MM	0.30	0.51	30FT BELOW GAGE
		89272	FLUME-200MM	0.17	0.50	50FT BELOW GAGE
SW12008		89272	FLUME-200MM	0.11	NA	.41MILES BELOW 12005
SW12009		89272	FLUME-200MM	0.10	NA	.90MILES BELOW 12005
SW24001	SEWAGE PLANT	89138	NA/VOLUMETRIC	0.01	NA	END OF PIPE
		89270	NA/VOLUMETRIC	NA	NA	VARIABLE FLOW
SW24002	N FIRST CREEK	89096	PYG CURRENT METER	0.32	0.47	35FT BELOW WEIR
		89111	PYG CURRENT METER	0.31	0.46/0.47	55FT BELOW GAGE
		89123	FLUME-200MM	0.79	0.52	30FT BELOW GAGE
		89135	PYG CURRENT METER	3.35	0.93/0.92	
SW24004	FIRST CREEK NORTH BOUNDARY	89114	FLUME-200MM	0.14	NA	
SW30002	FIRST CREEK AT NORTH PLANTS	89114	FLUME-200MM	0.46	NA	
SW36001	BASIN A	89271	NA-VOLUMETRIC	0.02	0.11	END OF DISC PIPE

APPENDIX A-2.3 TABLE A-2.3-1
SUMMARY OF DISCHARGE MEASURMENTS FOR MONITORING STATIONS

SITE ID#	SITE NAME	DATE	INSTRUMENT TYPE	DISCH (CFS)	STAGE (FT) START/STOP	COMMENTS LOCATION
SW37001	FIRST CREEK	89097	PYG CURRENT METER	0.29	0.51	40FT ABOVE FLUME
	OFF-POST	89110	PYG CURRENT METER	0.31	0.52	30FT ABOVE GAGE
		89123	FLUME-200MM	0.54	0.58	40FT ABOVE FLUME
		89194	FLUME-100MM	0.02	0.58	10FT BELOW FLUME

NA - NOT APPLICABLE
PYG - GURLEY 625 PYGMY CURRENT METER

WY89 Discharge Measurement Field Records

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY SEG
CHECKED BY ______

STATION NAME NORTH UVALDA SWOOO1

89269 DATE 9/26, 19 87 PARTY SEG, TG
WIDTH NA AREA NA VEL. NA G.H. .19 DISCH. ______

METHOD 100mm Flume NO. SECS ______ G.H. CHANGE ______ IN ______ HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS NA % DIFF. FROM NA RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 15 FEET, MILE, ABOVE, BELOW GAGE, AND ______

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW low, uniform WEATHER PARTLY CLOUDY ~75°F

OTHER ______ AIR ~75 °F@ 1120

GAGE Staff, type C WATER 15.8 °C / 60 °F @ 1151

______ RECORD REMOVED no INTAKE FLUSHED no

OBSERVER ______

CONTROL cement V notch weir

REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS

TIME		RECORDER	INSIDE	OUTSIDE
1127	.1'			.19
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
	100mm Long-Throated Flume						
	(Approximately 20 ft upstream of weir)						
1155	SET UP FLUME						
1325	UNABLE TO GET A READING NOT ENOUGH FLOW						
	OVER FLUME TO GET A READING						

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START @ 1600
FINISA @ 1620

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. 1
COMPILED BY JK
CHECKED BY

STATION NAME SOUTH PLANTS STEAM EFFLUENT (SW02006)

DATE 89117 4/27, 19 89 PARTY JK, LB, KH

WIDTH ____ AREA ____ VEL. ____ G.H. ____ DISCH. ____

METHOD LONG THROATED FLUME NO. SECS ____ G.H. CHANGE NA IN ____ HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ____ FEET, MILE, ABOVE, BELOW GAGE, AND ____

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ____

FLOW LOW - UNIFORM WEATHER COOL, CLOUDY, LT WIND

OTHER ____ AIR 55 °F@ 1500

GAGE NONE INSTALLED WATER 55 °F@ 1500

____ RECORD REMOVED NA INTAKE FLUSHED U L NA

OBSERVER ____

CONTROL NO CONTROL INSTALLED

REMARKS ____

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge

USED LONG THROATED FLUME

TOP OF TUBE TO TOP OF SILL = .900

TOT TO TOW = .630

TOTAL h = 0.27

Q = .3447

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R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JK
CHECKED BY ______

STATION NAME SOUTH PLANT STEAM EFF SW 02006

DATE 89167 6/16 ,19 99 PARTY JK
WIDTH ~1.5' AREA ______ VEL. ______ G.H. ______ DISCH. 0.0907
METHOD 100 MM FLUME NO. SECS NA G.H. CHANGE NA IN ____ HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ______ FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW- UNIFORM WEATHER WARM, SUNNY, NO WIND
OTHER ______ AIR 80° °F@ 1125
GAGE NONE INSTALLED WATER ~65° °F@ 1125
______ RECORD REMOVED NA INTAKE FLUSHED U/L NA
OBSERVER ______

CONTROL NO CONTROL INSTALLED
REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
USED	100	MM	LONG	THROATED	PORTABLE		FLUME
1115	- FLUME		IN	PLACE	h =	0.~~18~~	.16 JK 89167
1120	-	h =	0.17				
1125	-	h =	0.17				
1130	-	h =	0.17				
	CALLED		h =	0.17	FINAL		
		Q =		0.0907	CFS		

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JK
CHECKED BY ______

STATION NAME SP STEAM EFF

DATE 89201 7/20, 19 89 PARTY TG JK
WIDTH NA AREA NA VEL. NA G.H. NA DISCH. 0.0565
METHOD 100 MM FLUME NO. SECS NA G.H. CHANGE NA IN ____ HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS NA % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ______ FEET, MILE, ABOVE, BELOW GAGE, AND ______

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW - UNIFORM WEATHER WARM, SUNNY
OTHER ______ AIR 90 °F@ 1530
GAGE NONE INSTALLED WATER 70 °F@ 1530
______ RECORD REMOVED NA INTAKE FLUSHED U L NO

OBSERVER ______

CONTROL NONE INSTALLED
REMARKS Q TAKEN AT SAMPLE POINT

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
1527		SET	100 MM	FLUME	AFTER		
			CLEARING		CHANNEL		
1530.		h =	0.11		Q =	0.0424	
1535		h =	0.13		Q =	0.0565	
1540		h =	0.13		Q =	0.0565	
1545		h =	0.13		Q =	0.0565	

FINAL Q = 0.0565 CFS

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW02006

DATE 51270 9/27, 19 89 PARTY TG, SEG, GAP
WIDTH ______ AREA ______ VEL. ______ G.H. NA DISCH. .1107
METHOD 100 mm Flume NO. SECS ______ G.H. CHANGE ______ IN ____ HRS.

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING ______
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 10 FEET, MILE, ABOVE, BELOW GAGE, AND Station, stake

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW Low WEATHER Hot, Clear
OTHER ______ AIR 80 °F @ 1330
GAGE None installed WATER ______ °F @ ______
______ RECORD REMOVED ______ INTAKE FLUSHED U L ______
OBSERVER ______
CONTROL None installed
REMARKS Fall sampling

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
100 mm long throated Flume							
		h (ft)		cfs		Time	
#1		.19		.1107		1320	
#2		.19		.1107		1325	
#3		.19		.1107		1330	
Total length of reference tube = .5'							
Top of tube to top of sill = .48'							
Total depth of H_2O = .21' (in tube)							
		.5' - .21' = .29'					
		.48' - .29' = .19'					
		h = .19' = .1107 cfs					

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW02001

DATE 89268 9/25, 19 89 PARTY SG, GWP, TG
WIDTH 100mm AREA ____ VEL. ____ G.H. ____ DISCH. .06

METHOD Flume NO. SECS ____ G.H. CHANGE ____ IN ____ HRS.

METER TYPE ______
SPIN BEFORE MEAS. ____ AFTER ____
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ____ FEET, MILE, ABOVE, BELOW GAGE, AND ____

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW Low, Uniform WEATHER Clear, warm

OTHER ______ AIR 75 °F@ 1014

GAGE None WATER 12.9 °F@ 0823

____ RECORD REMOVED ____ INTAKE FLUSHED U L

OBSERVER ______

CONTROL None installed

REMARKS Fall Sampling - Flume intake port was plugged - was cleaned prior to measurement

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
100mm		Flume					
		h(ft)		cfs		Time	
#1		.14		.0643		0945	
#2		.14		.0643		0950	
#3		.14		.0643		0950	

Total length of reference tube = .5'
Top of tube to top of sill = .48'
Total depth of H_2O in tube = .16'
.5' - .16' = .34'
.48' - .34' = .14' (h)
h = .14 = .0643 cfs

FOPM31 / DEC 87

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW07002

DATE 9/25/89 87268, 19 89 PARTY GPP TG SG
WIDTH ______ AREA ______ VEL. ______ G.H. NONE DISCH. ~~.1445~~ .17 PD
METHOD 100 mm Flume NO. SECS ______ G.H. CHANGE ______ IN ______ HRS. 90025

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ______ FEET, MILE, ABOVE, BELOW GAGE, AND ______

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW low WEATHER Clear

OTHER ______ AIR 75° °F@ 1120

GAGE ______ WATER ______ °F@ ______

______ RECORD REMOVED ______ INTAKE FLUSHED U L ______

OBSERVER ______

CONTROL None Installed

REMARKS No Station, Fall Sampling

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
100 mm Flume							
		h		cfs		Time	
#1		.23		.1565		1103	
				.1697	PD 90025		
#2		.24		~~.1445~~		1105	
				.1697			
#3		.24		~~.1445~~	PD 90025	1110	
Total Length of reference tube = .5'							
Top of Tube to top of sill = .48'							
Total depth of H_2O = .26'							
	.5' - .26' = .24'						
	.48' - .24' = .24'						
				.1697 PD 90025			
	h = .24' = ~~.1445~~ cfs						

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW08001 S. 1st Creek

DATE 89272 9/29, 19 89 PARTY GPP TG
WIDTH 100 mm AREA ______ VEL. ______ G.H. None DISCH. .14
METHOD Flume NO. SECS ______ G.H. CHANGE ______ IN ____ HRS.

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING ______
WADING, ~~UPSTR.~~, DOWNSTR., SIDE BRIDGE ______ FEET, MILE, ABOVE, BELOW GAGE, AND
weir
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW low, Uniform WEATHER clear, warm
OTHER ______ AIR 85 °F @ 1155
GAGE ______ WATER 15.3 °C @ 1155
______ RECORD REMOVED ______ INTAKE FLUSHED U/L ______
OBSERVER ______

CONTROL None
REMARKS Grain/Mass measurement - Fall Sampling
Suspended Sed. sample taken.
G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
100	mm	Flume					
		h		cfs		Time	
#1		.22		.1445		1145	
#2		.22		.1445		1150	
#3		.22		.144		1155	

Total length of reference tube = .5'
Top of tube to top of sill = .48'
Total depth of H_2O in tube = .24'
.5 - .24 = .26'
.48 - .26 = .22' (h)
h = .22' = .1445 cfs

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9097

START - 1130
FIRST - 1205

LEW = 2.4'
REW = 9.8'
7.4'

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. WY89 #34 AA 88102
COMPILED BY LB
CHECKED BY

STATION NAME NEW SOUTH FIRST CREEK SW08003

DATE 4-7, 19 89 PARTY LB J.K
WIDTH 7.4' AREA 2.972 VEL. .200 G.H. .49 DISCH. .594

METHOD METER Flow 10 NO. SECS 20 G.H. CHANGE 0 IN 1.0 HRS.

METER TYPE Gurley No. 625 PYGMY CURRENT METER
SPIN BEFORE MEAS. 52 AFTER OND
MEAS. PLOTS ___ % DIFF. FROM ___ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 25 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

SLIGHT BREEZE - SW

FLOW LOW-MODERATE WEATHER PARTLY CLOUDY

OTHER DEPRESSION UPSTREAM OF MEASURED X-SECTION AIR 70 °F@ 1130

GH TAKEN

GAGE STAFF - GOOD COND WATER 52 °F@ 1130

RECORD REMOVED NO INTAKE FLUSHED U L NO

OBSERVER

CONTROL V-NOTCH - 15' UPSTREAM

REMARKS BANKS BUILT in TOWARDS CREEK ~ 4' ON EACH SIDE TO IMPROVE FLOW. CHANNEL STABLE FLOW CONSISTENT. SOME TUMBLE WEEDS UPSTREAM AND DOWNSTREAM OF X-SECTION

G.H. OF ZERO FLOW ___ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1130		0.49		0.49
1149		0.49		0.49
1205		0.49		0.49
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		0.49		0.49

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
2.4	.2	.15	0	30	0.000	0.030	0.000
2.8	.4	.36	0	30	0.000	0.144	0.000
3.2	.4	.43	10	30	0.333	0.172	0.057
3.6	.4	.41	9	30	0.300	0.164	0.049
4.0	.4	.39	8	30	0.266	0.156	0.041
4.4	.4	.42	8	30	0.266	0.168	0.046
4.8	.4	.38	9	30	0.300	0.152	0.046
5.2	.4	.44	7	30	0.233	0.176	0.041
5.6	.4	.43	1	30	0.033	0.172	0.006
6.0	.4	.48	1	30	0.033	0.192	0.006
6.4	.4	.44	8	30	0.266	0.188	0.050
6.8	.4	.48	4	30	0.133	0.192	0.026
7.2	.4	.52	1	30	0.033	0.208	0.007
7.6 TR 8/9098	.4	.46	9	30	0.300	0.184	0.055
8.0	.4	.44	5	30	0.167	0.176	0.029
8.4	.4	.41	11	30	0.367	0.164	0.060
8.8	.4	.37	9	30	0.300	0.148	0.044
9.2	.4	.33	7	30	0.233	0.132	0.031
9.6	.3 JL 8/9098	.18	0	30	0.000	0.054	0.000
9.8	.1 JL 8/9098	0	0	30	0.000	0.000	0.000
					0.200	2.972	.594

GK 8/9/

FOPM31 / DEC 87

[redacted] 89100 [redacted] [redacted]RT-[redacted]10 STOP-1647 [redacted] LE[redacted]3.[redacted]2[redacted] REW 10.70 [redacted] WIDTH [redacted]7.8 UPSTREAM

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JK
CHECKED BY ______

STATION NAME SOUTH FIRST CREEK

DATE APRIL 12 1989 PARTY KH JK BS
WIDTH 7.8' AREA 3.612 VEL. .295 G.H. .57 DISCH. 1.064

METHOD FLOW METER NO. SECS 40 G.H. CHANGE Ø IN 1.5 HRS.

METER TYPE GURLEY #625 PYGMY CURRENT NO.: NN63489 bch 4/12/89
SPIN BEFORE MEAS. 50 AFTER —
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR, DOWNSTR, SIDE BRIDGE 43 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW TO MODERATE WEATHER SUNNY LIGHT WIND <5mph

OTHER ______ AIR 50 °F@ 1536

GAGE STAFF GAGE WATER 45 °F@ 1536

RECORD REMOVED NO INTAKE FLUSHED U L NO

OBSERVER ______

CONTROL CONCRETE WEIR ≈ 30 FT UPSTREAM

REMARKS REMOVED TUMBLEWEEDS AND AQUATIC GROWTH 10'-20' below CEMENT CONTROL STRUCTURE

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1536			JK 89102	0.58
1536		.57	~~0.57~~	~~0.5~~ bch 4/12/89
1627		.57		.57
1647		.57		.57
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		.57		

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
2.90	.15	.40	Ø	40	0.000	.060	0.000
3.20	.30	.41	12	40	0.300	.123	0.037
3.50	.30	.42	13	40	0.325	.126	0.041
3.80	.30	.47	11	40	0.275	.141	0.039
4.10	.30	.48	13	40	0.325	.144	0.047
4.40	.30	.49	11	40	0.275	.147	0.040
4.70	.30	.44	10	40	0.250	.132	0.033
5.00	.30	.45	10	40	0.250	.135	0.034
5.30	.30	.45	10	40	0.250	.135	0.034
5.60	.30	.45	11	40	0.275	.135	0.037
5.90	.30	.50	12	40	0.300	.150	0.045
6.20	.30	.51	11	40	0.275	.153	0.042
6.50	.30	.52	10	40	0.250	.156	0.039
6.80	.30	.53	10	40	0.250	.159	0.040
7.10	.30	.52	10	40	0.250	.156	0.039
7.40	.30	.58	10	40	0.250	.174	0.044
7.70	.30	.59	11	40	0.275	.177	0.049
8.00	.30	.58	13	40	0.325	.174	0.057
8.30	.30	.58	14	40	0.350	.174	0.061
8.60	.30	.53 JK	14	40	0.350	.159	0.057
8.90	.30	.49	14	40	0.350	.147	0.050
9.20	.30	.46	18	40	0.450	.138	0.062
9.50	.30	.44	18	40	0.450	.132	0.059
9.80	.30	.41	15	40	0.375	.123	0.046
10.10	.30	.32	14	40	0.350	.096	0.034
10.40	.30	.22	Ø	40	0.000	.066	0.000
10.70	.15	.00	Ø	40	0.000	.000	0.000
					.295	3.612	1.064

FOPM31 / DEC 87

1035 - Measurement taken

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO.
COMPILED BY RA
CHECKED BY

STATION NAME South First Creek (SW08003)

DATE 4/25, 19 89 PARTY JK, RA
WIDTH NA AREA ____ VEL. ____ G.H. ____ DISCH. .71 cfs
METHOD 200mm Long ~~Throat~~ Flume NO. SECS ____ G.H. CHANGE Ø IN 15 HRS.
METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 40 FEET MILE, ABOVE, BELOW GAGE, AND
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ____

FLOW UNIFORM WEATHER SUNNY, BREEZY
OTHER ____ AIR 70's °F @ 1015
GAGE CLEAR WATER 64 °F @ 1015
____ RECORD REMOVED Yes prior to Q INTAKE FLUSHED U L No
OBSERVER ____

CONTROL CLEAR
REMARKS Sampled Spring at same time

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1000	BEFORE	0.47		0.47
1035	Q TAKEN	0.47		0.47
1042	AFTER	0.47		0.47
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		0.47		0.47

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge

$h_A - h_B = h$

$(.90) - (.49) = .41$

$h = .41 = Q = 0.72$ from table

FOPM31 / DEC 87

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO.
COMPILED BY ~~PA~~
CHECKED BY

STATION NAME South First Creek (SW08003)
DATE May 3 ,19 89 PARTY JK+BS
WIDTH ____ AREA ____ VEL. ____ G.H. 0.50 DISCH. 0.86
METHOD 200mm FLUME SECS ____ G.H. CHANGE 0 IN 5 HRS.
METER TYPE NA
SPIN BEFORE MEAS. ____ AFTER ____
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 40 FEET, MILE, ABOVE, BELOW GAGE, AND
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ____
FLOW Uniform WEATHER Sunny
OTHER ____ AIR 60's °F@
GAGE Good shape WATER 50's °F@
____ RECORD REMOVED NO INTAKE FLUSHED U L 00
OBSERVER ____

CONTROL Clear
REMARKS Checking for variation w/ flume Q measurement
G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
0915	Before	0.50	—	0.50
0920	During	0.50		0.50
0925	"	0.50		0.50
0930	"	0.50		0.50
0935	After	0.50		0.56
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		0.50		0.50

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
0920	h(2)	= 0.44		∴ Q	= 0.82		
0925	h(2)	= 0.45		∴ Q	= 0.86		
0930	h(2)	= 0.45		∴ Q	= 0.86		Looks good

FINAL Q = 0.86

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START 1031 REW = 1.8
END 1108 LEW = 14.5

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO.
COMPILED BY BS
CHECKED BY

STATION NAME SOUTH FIRST CREEK (SW08003)

DATE 89125 5/5 ,19 89 PARTY BS, JK, DG
WIDTH ______ AREA ______ VEL. ______ G.H. ______ DISCH. ______

METHOD .6 NO. SECS ______ G.H. CHANGE ______ IN ____ HRS.

METER TYPE BURLEY #625 PYGMY SER # NN6349
SPIN BEFORE MEAS. 40 AFTER 42
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 40 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW HIGH - NON UNIFORM WEATHER WARM SUNNY, BREEZY

OTHER SOME EDGE BACKWATER AIR 65 °F@ 1020

GAGE STAFF - GOOD SHAPE WATER 55 °F@ 1020

RECORD REMOVED NO INTAKE FLUSHED U L NO

OBSERVER DOUG GREER - RTL

CONTROL V-NOTCH CEMENT WEIR

REMARKS HIGH FLOW FOR UNKNOWN REASONS
CLEANED SAGE OUT DNSTRM OF CONTROL

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1020 MDT	BEFORE	1.23		1.23
1031	START	1.23		1.23
1052	MID	1.23		1.22
1108	END	1.23		1.22
1110	AFTER	1.23		1.22
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

	Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge	
	1.8	.25	.1	0	Ø				BW
	2.3	.50	.33	Ø	Ø				BW
	~~2.8~~	.50	~~.34~~	5/5/89	Ø				BW
	3.0	.50	.79	12	40	.30	.395	.1185	
	3.5	.50	1.00	12	40	.30	.500	.15	
	4.0	.50	1.15	14	40	.35	.575	.201	
	4.5	.50	1.30	21	40	.525	.65	.341	
	5.0	.50	1.22	31	40	.775	.61	.473	
	5.5	.50	1.08	33	40	.825	.54	.446	
	6.0	.50	.93	36	40	.900	.465	.419	
	6.5	.50	.97	42	40	1.05	.485	.509	
	7.0	.50	1.00	42	40	1.05	.500	.525	
	7.5	.50	1.05	43	40	1.075	.525	.564	
1052	8.0	.50	1.03	54	40	1.35	.515	.695	
	8.5	.50	1.07	51	40	1.275	.535	.682	
	9.0	.50	.80	65	40	1.625	.400	.65	
	9.5	.50	.75	61	40	1.525	~~.375~~	.572	
	10.0	.50	.62	71	40	1.775	.31	.550	
31	10.5	.50	.58	63	40	1.575	.29	.457	
31	11.0	.50	.59	49	40	1.225	.295	.361	
39	11.5	.50	.63	49	40	1.225	.315	.386	
35	12.0	.50	.67	45	40	1.125	.335	.377	
37	12.5	.50	.70	36	40	.900	.350	.315	
46	13.0	.50	.75	26	40	.65	.375	.244	
44	13.5	.50	.76	15	40	.375	.380	.146	
42	14.0	.50	.68	4	40	.100	.340	.034	BW
57	14.5	~~.50~~ .25	.37	5	40	.125	.093	.012	BW
								9.23	
								~~or~~ 9.275	

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BW = BACKWATER

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JK
CHECKED BY ______

STATION NAME SOUTH FIRST CREEK (SW09003)

DATE 89171 6/20 ,19 89 PARTY JK, KH, LH
WIDTH NA AREA ______ VEL. ______ G.H. ______ DISCH. ______

METHOD 200 MM FLUME NO. SECS NA G.H. CHANGE Ø IN .5 HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS NA % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 30 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW-MOD WEATHER WARM, SUNNY, LT WIND

OTHER ______ AIR 90° °F@ 1245

GAGE STAFF - GOOD COND WATER 60° °F@ 1245

______ RECORD REMOVED YES INTAKE FLUSHED U/L NO

OBSERVER ______

CONTROL V-NOTCH WEIR

REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS

TIME		RECORDER	INSIDE	OUTSIDE
1228		0.46		0.48
1245		048		0.48
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
1230	START MONITORING 200 MM LONG-THROATED FLUME						
1235	h = 0.40				Q = .6915		
1245	h = 0.40				Q = .6915		
1252	h = 0.40				Q = .6915		

Q = .6915 CFS

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JK
CHECKED BY ______

STATION NAME S 1st CRC

DATE 89201 7/20 ,19 89 PARTY TG, JK
WIDTH NA AREA NA VEL. NA G.H. 0.13 DISCH 0.0113
METHOD 100 MM FLUME NO. SECS NA G.H. CHANGE Φ IN .5 HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 30 FEET, MILE, ABOVE, BELOW GAGE, AND
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______
FLOW LOW - UNIFORM WEATHER WARM SUNNY
OTHER ______ AIR 90 °F@ 1340
GAGE STAFF - GOOD COND WATER 65 °F@ 1346
______ RECORD REMOVED EARLIER INTAKE FLUSHED U L NO

OBSERVER ______

CONTROL CEMENT V- NOTCH 20' UPSTREAM
REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1335				0.13
1343		0.13		0.13
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
1335	SET UP		100 MM		FLUME IN		
	WATER						
1336	h = 0.03				Q = NA		
1338	h = 0.045				Q = 0.0113		
1343	h = 0.045				Q = 0.0113		
			JK 89201				
1348	h = 0.045				Q = 0.0113		
	FINAL						
	Q = 0.0113						

FOPM31 / DEC 87

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ____
COMPILED BY TG
CHECKED BY ____

STATION NAME South 1st Creek SW08003

DATE 89269 9/26 ,19 87 PARTY TG, SEG, GPP
WIDTH 100 mm AREA ____ VEL. ____ G.H. 0.22 DISCH. .10

METHOD Flume NO. SECS ____ G.H. CHANGE 0 IN ____ HRS.

METER TYPE ____
SPIN BEFORE MEAS. ____ AFTER ____
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 30 FEET, MILE, ABOVE, BELOW GAGE, AND weir

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ____

FLOW Low, Uniform WEATHER Warm, Partly Cloudy

OTHER ____ AIR 80 °F@ 1445

GAGE ____ WATER 65 °F@ 1445

RECORD REMOVED No INTAKE FLUSHED U L No

OBSERVER ____

CONTROL Cement V-notch (120°) weir

REMARKS Fall Sampling

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1425				0.22
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
	100 mm	flume					
		h (ft)		cfs		Time	
#1		.17		.0907		1440	
#2		.18		.1004		1445	
#3		.18		.1004		1450	
Total length of reference tube = .5'							
Top of Tube to top of sill = .48'							
Total depth of H_2O in tube = .20'							
		.5' - .20' = .30'					
		.48' - .30' = .18'					
		h = .18' = .1004 cfs					
CR10	*6	1	.34724				
		2	.83643				
		3	26.244				
		4	1.000				
		5	12.11				
		6	0.000				

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW08003 S. 1st Creek

DATE 89272 9/29, 19 89 PARTY TG GDP
WIDTH 100 mm AREA ______ VEL. ______ G.H. 0.20 DISCH. .06
METHOD Flume NO. SECS ______ G.H. CHANGE 0 IN ____ HRS.

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 30 FEET, MILE, ABOVE, BELOW GAGE, AND weir

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW low, uniform WEATHER clear, warm

OTHER ______ AIR 85 °F@ 1240

GAGE .20 WATER 18.3 °C@ 1230

______ RECORD REMOVED ______ INTAKE FLUSHED U L

OBSERVER ______

CONTROL Cement v-notch weir

REMARKS Gageless measurement - Fall sampling - suspended sed. sample taken

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
100	mm	Flume					
		h Cft		cfs		Time	
				.0565 - TG			
#1		.13		~~.0565~~		1235	
						TG	
#2		~~.13~~		~~.0565~~		~~1238~~	1242
		.14 TG		.0643 TG			
#3		~~.13~~		~~.0565~~		1246	
		.14		.0643 TG			
Total length of tube = .5'							
Top of tube to top of sill = .48'							
Total depth of H_2O in tube = .16'							
	.5' - .16' = .34'						
	.48 - .34 = .14' (h)						
	h = .14' = .0643 cfs						
CR10 *6			1 .34427				
			2 .83294				
			3 18.616				
			4 1.000				
			5 12.065				
			6 0.00				

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW08004 S. 1st Creek

DATE 89272 9/29, 19 89 PARTY TG, GAP
WIDTH ______ AREA ______ VEL. ______ G.H. None DISCH. .04

METHOD 100 mm Flume NO. SECS ______ G.H. CHANGE ______ IN ______ HRS.

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING ______
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ______ FEET, MILE ABOVE, BELOW GAGE, AND ______

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW low, Uniform WEATHER clear, warm

OTHER ______ AIR 85 °F@ 1322

GAGE ______ WATER ______ °F@ ______

______ RECORD REMOVED ______ INTAKE FLUSHED U L ______

OBSERVER ______

CONTROL ______

REMARKS Gain/loss measurement
Fall sampling, suspended Sediment sample taken

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
100 mm Flume							
		h (ft)		cfs		Time	
#1		.10		.0360		1400	
#2		.10		.0360		1405	
#3		.10		.0360		1405	

Total length of reference tube = .5'
Top of tube to top of sill = .48'
Total depth of H_2O in tube = .12'
.5' - .12' = .38'
.48 - .38 = .10 (h)
h = .10' = .0360 cfs

FOPM31 / DEC 87

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JK
CHECKED BY ______

STATION NAME PEORIA INTERCEPTOR (SW11001)

DATE 89116 4/26, 19 89 PARTY JK, LB, KH
WIDTH ______ AREA ______ VEL. ______ G.H. ______ DISCH. ______

METHOD LONG THROATED FLUME NO. SECS NA G.H. CHANGE ______ IN ____ HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR, DOWNSTR, SIDE BRIDGE 30 FEET, MILE, ABOVE, BELOW GAGE AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW - UNIFORM WEATHER COOL, CLOUDY

OTHER ______ AIR 50° °F@ 1010

GAGE STAFF WATER 50° °F@ 1010

______ RECORD REMOVED ______ INTAKE FLUSHED U L

OBSERVER ______

CONTROL ______

REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1116		.76		.72
1125	JK 89116	~~.76~~ .72		.72
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
	USED	LONG	THROATED		FLUME		
TOT	- TOS	=	0.900'				
TOT	- TOW	=	0.750'				
	h =	0.15'					
	Q =	.1275 cfs					
			NEW	V-NOTCH	METAL	PLATE	HAS
				BEEN	INSTALLED	RECENTLY	

FOPM31 / DEC 87

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JK
CHECKED BY ______

STATION NAME PEORIA INTERCEPTOR

DATE 89201 7/20, 19 89 PARTY RG, JK
WIDTH NA AREA NA VEL. NA G.H. 0.69 DISCH. 0.1570

METHOD 200MM FLUME NO. SECS NA G.H. CHANGE Ø IN 1/2 HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 30 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW-UNIFORM WEATHER WARM & SUNNY

OTHER ______ AIR 90 °F @ 1715

GAGE METAL V-NOTCH WEIR w/STAFF WATER 65 °F @ 1715

______ RECORD REMOVED EARLIER INTAKE FLUSHED U L NO

OBSERVER ______

CONTROL V-NOTCH WEIR ≈ 25' UPSTREAM

REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1710				0.69
1719		0.69		0.69
1727		0.69		0.69
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
1710	SET	200MM		FLUME	IN	CHANNEL	
1715		h =	0.17		Q =	0.1570	
1719		h =	0.17		Q =	0.1570	
1723		h =	0.17		Q =	0.1570	
1727		h =	0.17		Q =	0.1570	

FINAL Q = 0.1570

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R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW11001 Prairie Interceptor

DATE 87270 9/27, 19 87 PARTY GRP, TG, SEG
WIDTH ______ AREA ______ VEL. ______ G.H. .70 DISCH. .0492

METHOD 100mm Flume NO. SECS ______ G.H. CHANGE -0.02 IN 1/2 HRS.

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR. DOWNSTR., SIDE BRIDGE 40 FEET, MILE, ABOVE, BELOW GAGE, AND ______

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW Low WEATHER Partly Cloudy, Wind 1-5 SW

OTHER ______ AIR 68 °F @ 0830

GAGE 0.72 WATER 60 °F @ 0924

______ RECORD REMOVED ______ INTAKE FLUSHED U/L

OBSERVER ______

CONTROL Metal V-notch Weir

REMARKS Fall sampling

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
100 mm		Long	throated		Flume		
		h (ft)		cfs		Time	
#1		.11		.0424		0845	
#2		.12		.0492		0855	
#3		.12		.0492		0900	
Total length of reference tube = .5'							
Top of tube to top of sill = .48'							
Total depth of H_2O = .14' (in tube)							
		.5' - .14' = .36'					
		.48 - .36' = .12'					
	h = .12' = .0492 cfs						
Data good Short dump							
		DLY	Run				
		CHNL	0445				
		ERR	0000				
		Time	0201.9				
	DSM	used	0030				
	OSS/wk		0.70	@ 0900			

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~~1415~~ START 1515 LEW 2.7 2.8 } TIME 1545

89101 REW 11.1 10.95 }

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY KH
CHECKED BY ______

STATION NAME HAVANA INTERCEPTOR

DATE 89101 APRIL 11 19 89 PARTY KH JK LL

WIDTH 8.4 AREA 2.46 VEL. 0.592 G.H. NA DISCH. 1.458

METHOD FLOW METER NO. SECS 40 G.H. CHANGE -0.01 IN 0.5 HRS.

METER TYPE GURLEY #625 PYGMY CURRENT NO. NN6343

SPIN BEFORE MEAS. 44 AFTER N/A

MEAS. PLOTS ______ % DIFF. FROM ______ RATING

WADING, UPSTR., DOWNSTR., SIDE BRIDGE 0.8 FEET, MILE, ABOVE, BELOW GAGE, AND BUBBLE LINE

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW TO MODERATE WEATHER PARTLY SUNNY WIND LT <5 mph

OTHER ______ AIR 35 °F@ ~~1415~~ 1515 4/11/89

GAGE NONE INSTALLED WATER 45 °F@ ~~1415~~ 1515

______ RECORD REMOVED NONE INTAKE FLUSHED NO

OBSERVER ______

CONTROL NONE / BLOCKAGE DOWNSTREAM CAUSING BACKUP

REMARKS DIRECTLY UNDER BRIDGE WHICH SPANS INT. 8' DOWNSTREAM FROM BUBBLER

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1515				.52
1530				.52
1545				.51
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
2.7	.2	0	0	30	~~.367~~	0	0.000
3.1	.4	0.06	0	30	0	.024	0.000
3.5	.4	0.11	11	30	.367	.044	0.016
3.9	.4	0.18	10	30	.333	.072	0.024
4.3	.4	0.26	12	30	.400	.104	0.042
4.7	.4	0.33	12	30	.400	.132 ~~.160~~	0.053
5.1	.4	0.40	13	30	.433	.160	0.069
5.5	.4	0.43	15	30	.500	.172	0.086
5.9	.4	0.48	18	30	.600	.192	0.115
6.3	.4	0.52	20	30	.667	.208	0.139
6.7	.4	0.57	17	30	.567	.228	0.129
7.1	.4	0.50	20	30	.667	.200	0.133
7.5	.4	0.50	22	30	.733	.200	0.147
7.9	.4	0.44	21	30	.700	.176	0.123
8.3	.4	0.39	23	30	.767	.156	0.120
8.7	.4	0.33	23	30	.767	.132	0.101
9.1	.4	0.25	23	30	.767	.100	0.077
9.5	.4	0.20	21	30	.700	.080	0.056
9.9	.4	0.13	16	30	.533	.052	0.028
10.3	.4	0.06	0	30	0	.024	0.000
10.7	.4	0.01	0	30	0	.004	0.000
11.1	.2	0	0	30	0	0	0.000

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R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

LEW 2.2'
REW 7.0'

BEGIN 1325
END 1340

MEASUREMENT NO.
COMPILED BY K HEDBERG
CHECKED BY

STATION NAME HAVANA INTERCEPTOR SW 11002

DATE 89116 Apr 26 ,19 89 PARTY KH JK LB
WIDTH 4.8' AREA .606 VEL. 5.80 G.H. NA DISCH. .366

METHOD 0.6 NO. SECS ~~?~~ 40 (89116) G.H. CHANGE NA IN ____ HRS.

METER TYPE PYGMY
SPIN BEFORE MEAS. 49 AFTER NA
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 10 FEET MILE, ABOVE BELOW GAGE AND (bah 89116)

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

FLOW LOW, UNIFORM WEATHER SUNNY, ~LT WIND 0-5MPH

OTHER ____ AIR 75 °F@ 1324

GAGE ____ WATER 53 °F@ 1324

____ RECORD REMOVED ____ INTAKE FLUSHED U L

OBSERVER NONE

CONTROL NONE

REMARKS LOW FLOW / NO STAFF OR RECORDER

G.H. OF ZERO FLOW ____ FT

GAGE READINGS

TIME		RECORDER	INSIDE	OUTSIDE
1330	MEASURED WITH TAPE	NA		0.25
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
2.2	0.15	0	0	40	0	0	0
2.5	0.3	0.04	0	40	0	.012	0
2.8	0.3	0.10	0	40	0	.030	0
3.1	0.3	0.14	25	40	.625	.042	.02625
3.4	0.3	0.18	27	40	.675	.054	.03645
3.7	0.3	0.22	28	40	.70	.066	.0462
~~3~~ 4.0	0.3	0.23	29	40	.725	.069	.050025
4.3	0.3	0.24	24	40	.60	.072	.0432
4.6	0.3	0.25	25	40	.625	.075	.046875
4.9	0.3	0.23	27	40	.675	.069	.046575
5.2	0.3	0.21	29	40	.725	.063	.045675
5.5	0.3	0.18	18	40	.45	.054	.0243
5.8	0.3	0.13	0	40	0	.000	0
6.1	0.3	0.11	0	40	0	.000	0
6.4	0.3	0.05	0	40	0	.000	0
6.7	0.3	0.02	0	40	0	.000	0
7.0	0.~~3~~15	0	0	40	0	.000	0
					5.80 ft/s	0.606	0.366

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ____
COMPILED BY JK
CHECKED BY ____

STATION NAME HAVANA INTERCEPTOR 11002
DATE 89201 7/20/c ,19 89 PARTY TG, JK
WIDTH NA AREA NA VEL. NA G.H. 0.23 DISCH 0.3670
METHOD 200 MM FLUME NO. SECS NA G.H. CHANGE Ø IN 5 HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR, DOWNSTR, SIDE BRIDGE ≈ 350 FEET, MILE, ABOVE, BELOW GAGE, AND BUBBLE LINE
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ____
FLOW LOW - SEMI-UNIFORM WEATHER WARM - SUNNY
OTHER ____ AIR 90 °F@ 1640
GAGE NONE INSTALLED WATER 70 °F@ 1640
____ RECORD REMOVED NA INTAKE FLUSHED NO

OBSERVER ____

CONTROL NONE INSTALLED
REMARKS Q MEASURED @ APPROX 75 FEET PAST THE END OF CONCRETE CHANNEL

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1659	DEPTH OVER BUBBLE LINE			0.223
1701	CRIO	0.2305		
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

JK 89201

Distance from Initial Point	Width	Depth	Revolutions	Time In Seconds	Velocity	Area	Discharge
1630	SET 200MM FLUME IN STREAM						
1635		h = 0.06'			Q = NA		
1639		h = 0.21'			Q = 0.2240		
1643		h = 0.25			Q = 0.3017		
1647		h = 0.28			Q = 0.3672		
1651		h = 0.28			Q = 0.3672		
1655		h = 0.28			Q = 0.3672		

FINAL
Q = 0.3670

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW11002 Hanover Interceptor

DATE 89270 9/27, 1989 PARTY GPP, TG, SEG
WIDTH 200 mm AREA ______ VEL. ______ G.H. ______ DISCH. .49

METHOD Flume NO. SECS ______ G.H. CHANGE ______ IN ______ HRS.

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR, (DOWNSTR.) SIDE BRIDGE 500 FEET, MILE, ABOVE, (BELOW GAGE) AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW Low, Uniform WEATHER Partly cloudy

OTHER ______ AIR 75 °F@ 1034

GAGE Depth over bubbler line WATER ______ °F@ ______

______ RECORD REMOVED no INTAKE FLUSHED no

OBSERVER ______

CONTROL Concrete channel

REMARKS Fall sampling, measurement made 100' below the end of concrete channel

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
200 mm length throated flume							
		h(ft)		cfs		Time	
#1		.33		.4900		1020	
#2		.33		.4900		1025	
#3		.33		.4900		1030	

Total length of reference tube = 1.05'

Top of tube to top of sill = .901'

Total depth of H_2O = .47' (in tube)

1.05 − .47' = .58'

.901' − .58' = .33'

h = .33' = .4900 cfs

Depth over bubbler line = 0.249

CR10 ~~*6~~
1 .2539?
2 .9854?
3 15.128
4 1.0400
5 12.050
6 0.00

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Looking downstream LEW 7.1'
REW 2.1'
START: 1028
STOP 1048

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY ~~SG~~
CHECKED BY ______

STATION NAME UVALDA DITCH C 12001 ad 90025

DATE APRIL 20, 19 89 (8911O) PARTY JK, SG
WIDTH 5.00' AREA 1.92 VEL. 2.40 G.H. NA DISCH. 0.325

METHOD .60 NO. SECS 40 G.H. CHANGE NA IN Ø HRS.

METER TYPE PYGMY
SPIN BEFORE MEAS. 47 AFTER 45
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ______ FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW, UNIFORM WEATHER SUNNY ~65°F, NO WIND, SL. CLOUDY

OTHER ______ AIR 65 °F@ 1030

GAGE ______ WATER 55 °F@ 1030

RECORD REMOVED NONE INTAKE FLUSHED U L NONE

OBSERVER ______

CONTROL NONE INSTALLED

REMARKS BOTTOM VERY SOFT, SILTY, BANK OF VARIABLE WIDTH - DISCHARGE TAKEN AT NARROW PART OF CHANNEL

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1030 JK 8911O				
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
2.1'	.15 ~~.15~~	.00	0	0	0.000	0.000	0.000
2.4'	.30	.15	0	40	0.000	0.045	0.000
2.7'	.30	.28	0	40	0.000	0.084	0.000
3.0'	.30	.33	1	40	0.025	0.099	0.002
3.3'	.30	.33	10	40	0.250	0.099	0.025
3.6'	.30	.41'	9	40	0.225	0.123	0.028
3.9'	.30	.40'	11	40	0.275	0.120	0.033
4.2'	.30	.42	12	40	0.300	0.126	0.038
4.5'	.30	.50	13	40	0.325	0.150	0.049
4.8'	.30	.50	8	40	0.200	0.150	0.030
5.1'	.30	.51	15	40	0.375	0.153	0.057
5.4'	.30	.50	11	40	0.275	0.150	0.041
5.7'	.30	.49	6	40	0.150	0.147	0.022
6.0'	.30	.56	0	40	0.000	0.168	0.000
6.3'	.30	.48	0	40	0.000	0.144	0.000
6.6'	.30	.35	0	40	0.000	0.105	0.000
6.9'	~~.30~~ .25	.15	0	40	0.000	0.037	0.000
7.1	.10	.15	0	40	0.000	0.015	0.000
					2.40	1.92	0.325

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R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ____
COMPILED BY TG
CHECKED BY ____

STATION NAME SW12001

DATE 82268 9/25 ,19 89 PARTY SEG, CWP, TG
WIDTH ____ AREA ____ VEL. ____ G.H. ____ DISCH. .27
100 mm

METHOD Flume NO. SECS ____ G.H. CHANGE ____ IN ____ HRS.

METER TYPE
SPIN BEFORE MEAS. ____ AFTER ____
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ____ FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ____

FLOW low WEATHER Clear, Hot

OTHER ____ AIR 80 °F@ 1505

GAGE None WATER 62 °F@ 1514

____ RECORD REMOVED ____ INTAKE FLUSHED U L

OBSERVER ____

CONTROL None

REMARKS Fall sampling

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
100	mm	Flume					
		h (ft)		cfs		Time	
#1		.30		.2552		1455	
#2		.31		.2748		1505	
#3		.31		.2748		1510	

Total length of reference tube = .5'
Top of tube to top of sill = .48'
Total depth of H_2O in tube = .33'
.5' - .33 = .17'
.48 - .17 = .31' = h
h = .31' = .2748 cfs

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

START = 1520 REW 2.20
END = 1547 LEW 6.20

MEASUREMENT NO. WY89 #1
COMPILED BY DK
CHECKED BY

STATION NAME SOUTH UVALDA 12005

DATE 89080 3/21, 19 89 PARTY JK, LB
WIDTH 4.00' AREA .928 VEL. .280 G.H. 3.85 DISCH. .260

METHOD .6 NO. SECS ~~30/40~~ 14 G.H. CHANGE 0 IN .5 HRS.

METER TYPE PYGMY NO. 625
SPIN BEFORE MEAS. 55 AFTER 45
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 50 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

FLOW LOW - MOD/UNIFORM WEATHER GOOD - WARM/SUNNY

OTHER ____ AIR 45 °F @ 1600

GAGE STAFF - GOOD COND WATER 45 °F @ 1600

RECORD REMOVED NO INTAKE FLUSHED U L YES

OBSERVER

CONTROL CEMENT WEIR - 30' UPSTREAM OF MEAS PT.

REMARKS ℄ LOCATION HAS METAL SHEETING ON EAST BANK

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1520		3.85'		3.85'
1538		3.85'		3.85'
1547		3.85'		3.85'
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		3.85		3.85

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
2.35'	.15	.13	∅	∅	0.000	0.020	0.000
2.65	.30	.26	∅	30	0.000	0.060	0.000
2.95	.30	.22	8	40	0.200	0.066	0.013
3.25	.30	.31	16	30	0.533	0.093	0.050
3.55	.30	.25	14	30	0.467	0.075	0.035
3.85	.30	.26	17	30	0.567	0.078	0.044
4.15	.30	.28	12	30	0.400	0.084	0.034
4.45	.30	.29	13	30	0.433	0.087	0.038
4.75	.30	.22	12	30	0.400	0.066	0.026
5.05	.30	.23	7	30	0.233	0.068	0.016
5.35	.30	.21	2	30	0.067	0.063	0.004
5.65	.30	.21	0	30	0.000	0.063	0.000
5.95	.30	.19	0	30	0.000	0.057	0.000
6.20	.25	.19	0	∅	0.000	0.048	0.000
					.280	0.928	0.260

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START 1554 REW 6.20
FINISH 1613 LEW 2.20

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. WY89 #2
COMPILED BY LB
CHECKED BY

STATION NAME SOUTH UVALDA 12005

DATE 89080 3/21, 19 89 A PARTY LB, JK
WIDTH 4.0 AREA ~~0.910~~ 0.965 VEL. 0.310 G.H. 3.85 DISCH. 0.299
METHOD FLOW METER .6 NO. SECS ~~1/1~~ 45 JL 89080 G.H. CHANGE Ø IN 1.0 HRS.
METER TYPE PYGMY # 625
SPIN BEFORE MEAS. 55 AFTER 45
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR. (DOWNSTR.) SIDE BRIDGE 50 (FEET) MILE, ABOVE, (BELOW GAGE,) AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

FLOW LOW - MOD WEATHER WARM, SUNNY, LT BREEZE
OTHER AIR 45 °F@ 1600
GAGE STAFF - GOOD - COND WATER 45 °F@ 1600
RECORD REMOVED NO INTAKE FLUSHED Ø

OBSERVER

CONTROL CEMENT WEIR - 30' UPSTREAM
REMARKS ① LOCATION HAS METAL SHEETING ON EAST BANK

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1554		3.85'		3.85'
1606		3.85'		3.85'
163		3.85'		3.85'
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		3.85		3.85

2.20 Distance from Initial Point	.15 Width	Depth	Revolutions	Time in Seconds	Ø? Velocity	Area	Discharge
2.40	.20	.12	Ø	Ø	0.000	0.024	0.000
2.70	.30	.23	4	30	0.133	0.069	0.009
3.00	.30	.25	7	30	0.233	0.075	0.017
3.30	.30	.29	16	30	0.533	0.087	0.046
3.60	.30	.26	16	30	0.533	0.087	0.046
3.90	.30	.27	17	30	0.567	0.081	0.046
4.20	.30	.29	11	30	0.367	0.087	0.032
GH 4.50	.30	.28	19	30	0.633	0.084	0.053
4.80	.30	.24	12	30	0.400	0.072	0.029
5.10	.30	.25	7	30	0.233	0.075	0.017
5.40	.30	.23	1	30	0.033	0.069	0.002
5.70	.30	.21	Ø	30	0.000	0.063	0.000
6.00	.30	.18	Ø	30	0.000	0.054	0.000
6.20	.20	.19	Ø	30	0.000	0.038	0.000
					0.310	0.965	0.299

FOPM31 / DEC 87

START 1255 gage 3.81 LEW [illegible]9 UPSTREAM

FINISH 1331 REW 1.8

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO.
COMPILED BY keh 4/17/89 ~~JK~~ KH
CHECKED BY

STATION NAME SOUTH UVALDA SW/2005

DATE 89107 4/17, 19 89 PARTY SG, KH, JK
WIDTH 4.1 AREA ~~.549~~ .649 VEL. .543 G.H. 3.81 DISCH. 0.352

METHOD FLOW(0.6) NO. SECS ______ G.H. CHANGE ______ IN ____ HRS.

METER TYPE PYGMY CURRENT METER (GURLEY) #625 NO. NN6349
SPIN BEFORE MEAS. 60 sec AFTER 52 sec
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ______ FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW-MODERATE WEATHER SUNNY; WIND < 5mph

OTHER ______ AIR 60 °F@ 1248

GAGE ______ WATER 55 °F@ 1248

______ RECORD REMOVED ______ INTAKE FLUSHED U L

OBSERVER PAUL WHITE, BRAD STEPHENSON

CONTROL ______

REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1203	READJUSTED TO GH	3.82		3.82
1254		3.81		3.81
1321	*	3.81		3.81
1331		3.81		3.81
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
1.8	~~.3.75~~ keh 4/17/89	0 keh 4/17	0.0	40	.000	.000	0.00
~~2.1~~ keh 4/17	0.3	~~.18~~	keh 4/17				
2.2	0.2	.18	19	40	.475	.036	.0171
2.4	0.2	.18	21	40	.525	.036	.0189
2.6	0.2	0.20	25	40	.625	.040	.025
2.8	0.2	0.22	27	40	.675	.044	.0297
3.0	0.2	0.18	20	40	.50	.036	.018
3.2	0.25	0.17	22	40	.55	.0425	.023375
3.5	0.3	0.17	16	40	.40	.051	.0204
3.8	0.3	0.18	23	40	.575	.054	.03105
* 4.1	0.3	0.16	24	40	.60	.048	.0288
4.4	0.3	0.18	23	40	.575	.054	.03105
4.7	0.3	0.18	22	40	.55	.054	.0297
5.0	0.3	0.18	24	40	.60	.054	.0324
5.3	0.3	0.14	23	40	.575	.042	.02415
5.6	0.3	0.19	16	40	.40	.057	.0228
5.9	0.15	0.00	0	40	.000	.000	.000
					0.543	0.649	0.352

FOPM31 / DEC 87

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO.
COMPILED BY BA
CHECKED BY

STATION NAME S. Uvalda (SW12005)

DATE 4/21, 19 89 PARTY JK, BS
WIDTH ____ AREA ____ VEL. ____ G.H. 3.84 DISCH. 0.2615
METHOD LONG THROATED FLUME NO. SECS ____ G.H. CHANGE 0 IN ____ HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER ____
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 30 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: ~~CROSS SECTION~~

FLOW SEMI-UNIFORM WEATHER P. CLOUDY

OTHER ____ AIR 75 °F@ 1530

GAGE OK WATER 55 °F@ 1530

RECORD REMOVED NO INTAKE FLUSHED U L

OBSERVER RTI

CONTROL OK

REMARKS 1ST TIME W/ 0.66' LONG THROATED FLUME

G.H. OF ZERO FLOW 3.43 FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1525		3.84		3.84
1530		3.84		3.84
1535		3.84		3.84
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		3.84		3.84

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge

$h_A = \left(\begin{array}{c} \text{TOP OF TUBE} \\ \text{TO} \\ \text{TOP OF SILL} \end{array} \right)$

$h_B = \left(\begin{array}{c} \text{TOP OF TUBE} \\ \text{TO} \\ \text{TOP OF WATER} \end{array} \right)$

$(h_A - h_B) = h_2$

$(0.901 - .672) = 0.229 = 0.23$

BA 88/11

$0.23 = Q$ of $= 0.2615$ from table

1349

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JK
CHECKED BY ______

STATION NAME South UVALDA (SW12005)

DATE 89171 6/20, 19 89 PARTY LH, KH, JK

WIDTH NA AREA ______ VEL. ______ G.H. 3.88 DISCH. .5440

METHOD 200MM FLUME NO. SECS ______ G.H. CHANGE Ø IN 5 HRS.

METER TYPE NA

SPIN BEFORE MEAS. NA AFTER NA

MEAS. PLOTS ______ % DIFF. FROM ______ RATING

WADING, UPSTR., DOWNSTR., SIDE BRIDGE NA FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW Low - UNIFORM WEATHER COOL, SUNNY

OTHER ______ AIR 85 °F@ 1340

GAGE Staff - good cond WATER 60 °F@ 1340

______ RECORD REMOVED NO INTAKE FLUSHED U/L NO

OBSERVER ______

CONTROL V-NOTCH WEIR APPROX 30' UPSTREAM

REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1349		3.88		3.88
1330		3.88		3.88
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
Q	MEASURED		USING	200	MM	LONG	
	THROATED		FLUME				
1325	SET	UP	FLUME	IN	CHANNEL		
1330	h = .30						
1335	h = .34						
1340	h = .35						
1345	h = .35						
1349	FINAL	h = .35			Q = .5440 cfs		

FOPM31 / DEC 87

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME South Uvalde SW12005

DATE 87269 9/26, 19 87 PARTY TG, GRP, SEG
WIDTH 200mm AREA ______ VEL. ______ G.H. .51' DISCH. .30

METHOD Flume NO. SECS ______ G.H. CHANGE 0 IN ____ HRS

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., ~~DOWNSTR.~~, SIDE BRIDGE 30 FEET, MILE, ABOVE, BELOW GAGE, AND weir

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW Low, Uniform WEATHER Sunny, clear

OTHER ______ AIR 70 °F@ 0920

GAGE ______ WATER 52 °F@ 0920

______ RECORD REMOVED ______ INTAKE FLUSHED U L

OBSERVER ______

CONTROL Cement V-notch weir

REMARKS Fall Sampling

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
200	mm	Flume					
		h (ft)		cfs		Time	
#1		.24		.2813		0910	
#2		.25		.3017		0915	
#3		.25		.3017		0920	
Total length of reference tube = 1.05'							
Top of tube to top of sill = .901							
Total depth of H_2O in tube = .40'							
	1.05 - .40 = .65'						
	.901 - .65 = .25 (h)						
	h = .25' = .3017 cfs						
CR10	*1	1	.31779				
		2	.94376				
		3	14.080				
		4	1.000				
		5	12.098				
		6	0.000				
Depth over bubbler line = .31'							

FOPM31 / DEC 87

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW12005 S. Uvalda

DATE 89272 9/29, 1989 PARTY TG GPP
WIDTH 200 mm AREA ______ VEL. ______ G.H. .50 DISCH. .17

METHOD Flume NO. SECS ______ G.H. CHANGE 0 IN ______ HRS.

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 50 FEET, MILE, ABOVE, BELOW GAGE, AND weir

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW medium, Uniform WEATHER Clear, warm

OTHER ______ AIR 85 °F@ 1541

GAGE .50 WATER ______ °F@ ______

______ RECORD REMOVED No INTAKE FLUSHED U L No

OBSERVER ______

CONTROL Cement V-notch weir

REMARKS Gain/loss measurement
Fall sampling

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
200 mm Flume							
		h(ft)		cfs		Time	
#1		.18		.1727		1515	
#2		.18		.1727		1515	
#3		.18		.1727		1515	

Total length of reference tube = 1.05'
Top of tube to top of sill = .901'
Total depth of H_2O in tube = .33'
1.05' − .33' = .72'
TG ~~.72~~ .901' − .72 = .18 (h)
h = .18 = .1727 cfs

CR10 –

FOPM31 / DEC 87

R.L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY TG
CHECKED BY ______

STATION NAME SW1200 78 PA 90024

DATE 89272 9/29, 19 89 PARTY GDP, TG
WIDTH ______ AREA ______ VEL. ______ G.H. None DISCH. .11
METHOD 200 mm Flume NO. SECS ______ G.H. CHANGE ______ IN ____ HRS.

METER TYPE ______
SPIN BEFORE MEAS. ______ AFTER ______
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR, DOWNSTR, SIDE BRIDGE .41 ~~FEET~~, MILE ABOVE, BELOW GAGE, AND Wier (Station 1200S)
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW ______ WEATHER Clear, Warm
OTHER ______ AIR 80 °F@ 1643
GAGE ______ WATER ______ °F@ ______
______ RECORD REMOVED ______ INTAKE FLUSHED U L
OBSERVER ______

CONTROL ______
REMARKS Gain/loss measurement
Fall Sampling

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
200	mm	Flume					
		h		cfs		Time	
#1		.13		.1007		1700	
#2		.14		.1137		1705	
#3		.14		.1137		1710	

Total length of reference tube = 1.05'
Top of tube to top of sill = .901
Total depth of H_2O in sill = .29'
1.05' - .29' = .76'
.901' - .76 = .14' (h)
h = .14' = .1137 cfs

FOPM31 / DEC 87

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ____
COMPILED BY TG
CHECKED BY ____

STATION NAME ~~SW12006~~ SW120089 6PP89279 BA 90024

DATE 89272 9/29, 19 89 PARTY TG GPP
WIDTH 200mm AREA ____ VEL. ____ G.H. none DISCH. .10

METHOD Flume NO. SECS ____ G.H. CHANGE ____ IN ____ HRS.

METER TYPE ____
SPIN BEFORE MEAS. ____ AFTER ____
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE .9 FEET, MILE, ABOVE, BELOW GAGE, AND Station 12005
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ____

FLOW low, Uniform WEATHER Clear, Warm

OTHER ____ AIR 80 °F@ 1608

GAGE ____ WATER ____ °F@ ____

____ RECORD REMOVED ____ INTAKE FLUSHED U L

OBSERVER ____

CONTROL ____

REMARKS Gainless measurement
Fall sampling

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
200 mm Flume							
		h(ft)		cfs		Time	
#1		.12'		.0883		1610	
#2		.13		.1007		1615	
#3		.13		.1007		1615	

Total length of reference tube = 1.05'
Top of tube to top of sill = .901
Total depth of H_2O in sill = .28'

1.05 − .28 = .77
.901 − .77 = .13(h)
h = .13 = .1007 cfs

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ____
COMPILED BY ~~LB, KH~~
CHECKED BY ____ 90026 cs

STATION NAME SEWAGE TREATMENT PLANT SW24001

DATE 89138 ,19 ____ PARTY LB, KH
WIDTH NA AREA NA VEL. NA G.H. NA DISCH. 0.005

METHOD BUCKET NO. SECS NA G.H. CHANGE NA IN ____ HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE NA FEET, MILE, ABOVE, BELOW GAGE, AND ____

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ____

FLOW LOW-UNIFORM WEATHER COOL, PT CLOUDY

OTHER ____ AIR 70° °F@ 1100

GAGE NONE WATER 60° °F@ 1100

____ RECORD REMOVED NO INTAKE FLUSHED U/L NO

OBSERVER ____

CONTROL ____

REMARKS USED BUCKET METHOD TO FIGURE CFS

G.H. OF ZERO FLOW NA FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge

FLOW FROM PIPE AT COMPLETION
OF SAMPLING WAS
≈ 2.5 GPM

1 CFS = 7.48 GALS

THEREFOR FLOW AT STP
= ~~.0005~~ cfs

$\frac{2.5 \text{ GALS}}{\text{MIN}} \cdot \frac{1}{7.48 \text{ CU FT/GAL}} = \frac{2.5 \text{ GAL/MIN}}{7.48 \text{ CU FT/GAL}} =$

.334 CU FT/MIN

.334 CU FT/MIN / 60 SEC/MIN = .006 CU FT/SEC

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO.
COMPILED BY GPP
CHECKED BY

STATION NAME SW24001 Sewage Treatment Plant

DATE 89270 9/27/89 ,19 89 PARTY GPP, TG, SEG
WIDTH NA AREA NA VEL. NA G.H. NA DISCH. NA
METHOD ~~NA~~ Volumetric GPP NO. SECS NA G.H. CHANGE ____ IN ____ HRS.
METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS NA % DIFF. FROM NA RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE NA FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION NA
FLOW MED. - NON UNIFORM WEATHER partly cloudy
OTHER NA AIR 85 °F @ 1420
GAGE NA - NONE INSTALLED WATER 22.3 °C @ 1420
RECORD REMOVED NA INTAKE FLUSHED U L NO
OBSERVER ~~SEG~~

CONTROL NONE - RETENTION BASIN
REMARKS SEWAGE TRT EFFLUENT - WATER

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in ~~Seconds~~	Velocity	Area	Discharge
Volumetric Discharge MEASUREMENT							
TAKEN AT DISCHARGE PIPE WITH A BUCKET							
	4 gal	per	39 sec				
	4 gal	per	38 sec	1403			
	4 gal	per	26 sec	1404			
	4 gal	per	18 sec	1405			
	4 gal	per	14 sec	1406			
DISCHARGE VARIED TOO MUCH TO MAKE							
A VOLUMETRIC DISCHARGE MEASUREMENT							

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

LEW = 3.15'
REW = 9.15'

TIME
S = 1510
F = 1530

MEASUREMENT NO. WY 89 #3
COMPILED BY JK
CHECKED BY

24002

STATION NAME NORTH FIRST CREEK (SW7777)

DATE 89096 4-6, 19 89 PARTY LB, JK

WIDTH 6.00' AREA 3.537 VEL. 0.091 G.H. 0.47 DISCH. 0.323

METHOD .6 METER NO. SECS ~~30~~ 21 OK 89096 G.H. CHANGE Ø IN .5 HRS.

METER TYPE PYGMY #625

SPIN BEFORE MEAS. 48 AFTER 45

MEAS. PLOTS ___ % DIFF. FROM ___ RATING

WADING, UPSTR., DOWNSTR., SIDE BRIDGE 40 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

FLOW LOW- MODERATE WEATHER WARM, SUNNY, WINDY

OTHER WIND RIPPLING SURFACE AIR 65 °F@ 1530

GAGE STAFF / 40' UPSTREAM WATER 50 °F@ 1530

RECORD REMOVED NO INTAKE FLUSHED U L NO

OBSERVER

CONTROL V-NOTCH WEIR ≈ 35' UPSTREAM

REMARKS APPROX 40' DOWNSTREAM, AREA FULL OF VEGETATION, VEG REMOVED - NO EFFECTS

G.H. OF ZERO FLOW ___ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1510		0.47'		0.47'
1522		0.47'		0.47'
1530		0.47'		0.47'
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		0.47		0.47

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
3.15	.15	.28	Ø	Ø	0.000	0.042	0.000
3.45	.30	.33	Ø	30	0.000	0.099	0.000
3.75	.30	.42	Ø	30	0.000	0.126	0.000
4.05	.30	.51	Ø	30	0.000	0.153	0.000
4.35	.30	.60	Ø	30	0.000	0.180	0.000
4.65	.30	.70	Ø	30	0.000	0.210	0.000
4.95	.30	.77	Ø	30	0.000	0.231	0.000
5.25	.30	.80	Ø	30	0.000	0.240	0.000
5.55	.30	.84	2	30	0.067	0.252	0.017
5.85	.30	.83	11	30	0.367	0.249	0.091
6.15	.30	.78	11	30	0.367	0.234	0.086
6.45	.30	.75	7	30	0.233	0.225	0.052
6.75	.30	.74	6	30	0.200	0.222	0.044
7.05	.30	.70	2	30	0.067	0.210	0.014
7.35	.30	.63	2	30	0.067	0.189	0.013
7.65	.30	.57	1	30	0.033	0.171	0.006
7.95	.30	.50	Ø	30	0.000	0.150	0.000
8.25	.30	.49	Ø	30	0.000	0.147	0.000
8.55	.30	.40	Ø	30	0.000	0.120	0.000
8.85	.30	.29	Ø	30	0.000	0.087	0.000
9.15	.15	.00	Ø	Ø	0.000	0.000	0.000
					0.091	3.537	0.323

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QP(G)N

.3 EW 3' 4/21/89 7.8' START - 1056
REW ~~7.1 6.9~~ keh 4/21/89 1.5' FINISH - 1128

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY KEH
CHECKED BY ______

STATION NAME 24002 NORTH FIRST CREEK

DATE 89111 4/21 19 89 PARTY L. BROUILLARD, K. HEIDBERG
WIDTH 6.3 AREA 2.705 VEL. 1.35 G.H. 0.47 DISCH. .313

METHOD .6 NO. SECS 40 each G.H. CHANGE +0.01 IN 1/2 HRS.

METER TYPE GURLEY Pygmy Current Meter #625 No.
SPIN BEFORE MEAS. 31 AFTER 46
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ~~40~~ 55 keh 4/21/89 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW non uniform, low WEATHER SUNNY 75°F SLIGHT BREEZE

OTHER ______ AIR 75 °F@ 1045

GAGE STEVENS TYPE F, GAGE WATER 40 °F@ 1045

NO RECORD REMOVED NO INTAKE FLUSHED U L

OBSERVER PAUL WHITE, JULIE STEPHENS

CONTROL WEIR (CEMENT CONTROL STRUCTURE)

REMARKS Higher flow on right edge; measurement suspect as low flow will not turn meter consistently

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
keh 4/21/89 ~~1037~~			~~0.46~~	~~0.47~~
1056	START		0.46	0.46
1119			0.47	0.47
1128	FINISH		0.47	0.47
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
7.8	0.5	0.05	0	40	0	.025	0
6.8	1.0	0.20	0	40	0	.200	0
5.8	keh 4/21/89 ~~0.8~~ 0.7	0.42	0	40	0 keh 4/21/89	~~.336~~ .294	0
5.4	keh 4/21/89 ~~0.4~~ 0.5	0.62	0	40	0 keh 4/21/89	~~.248~~ .310	0
~~5.0~~		~~0.60~~		~~40~~			keh 4/21/89
4.8	0.5	0.60	7	40	.175	.300	.0525
4.4	0.4	0.61	7	40	.175	.244	.0427
4.0	0.4	0.62	7	40	.175	.248	.0434
3.6	0.4	0.65	7	40	.175	.260	.0455
3.2	0.4	0.63	7	40	.175	.252	.0441
2.8	0.4	0.55	8	40	.200	.220	.0440
2.4	0.35	0.42	11	40	.275	.147	.040425
2.1	0.3	0.41	0	40	0	.123	0
1.8	0.3	0.28	0	40	0	.074	0
1.5	0.15	0.05	0	40	0	.0075	0
						2.705	
					1.35 ft/s		.313 cfs

FOPM31 / DEC 87

8912

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO.
COMPILED BY BJJ
CHECKED BY

STATION NAME North 1st Creek (SW 24002)

DATE 89123 MAY 3, 19 89 PARTY BB JIC

WIDTH ____ AREA ____ VEL. ____ G.H. 0.52 DISCH. 0.79

METHOD 200MM FLUME SECS ____ G.H. CHANGE 0 IN .5 HRS.

METER TYPE NA

SPIN BEFORE MEAS. ____ AFTER ____

MEAS. PLOTS ____ % DIFF. FROM ____ RATING

WADING, UPSTR., DOWNSTR., SIDE BRIDGE 30 FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

FLOW UNIFORM WEATHER SUNNY

OTHER ____ AIR ·60? °F@

GAGE CLEAR WATER 50? °F@

____ RECORD REMOVED NO INTAKE FLUSHED U L NO

OBSERVER

CONTROL CLEAR

REMARKS MEASURING Q w/TIME

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1005	BEFORE	0.52		0.52
1020	DURING	0.52		0.52
1025	"	0.52		0.52
1030	"	0.52		0.52
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		0.52		0.52

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
1020	h(2) =		0.42 ∴		Q =	0.76	
1025	h(2) =		0.43 ∴		Q =	0.79	
1030	h(2) =		0.43 ∴		Q =	0.79	GOOD
		FINAL	Q =	0.79			

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R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO.
COMPILED BY JK
CHECKED BY

STATION NAME NORTH FIRST CREEK

DATE 89135 5/15, 19 89 PARTY B.S JK
WIDTH 3.9 AREA 1.986 VEL. 1.345 G.H. 0.92 DISCH. 3.35

METHOD .6 NO. SECS ____ G.H. CHANGE ____ IN ____ HRS.

METER TYPE GURLEY #625 PYGMY
SPIN BEFORE MEAS. 49 AFTER 43
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ____ FEET, MILE, ABOVE, BELOW GAGE, AND
MID 1032

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON
FOLLOWING CONDITIONS: CROSS SECTION NON

FLOW MOD - UNIFORM WEATHER COOL, CLOUDY

OTHER ____ AIR 45° °F@ 0950

GAGE STAFF - GOOD COND. WATER 45° °F@ 0950

RECORD REMOVED NO INTAKE FLUSHED U L NO

OBSERVER

CONTROL CLEAR

REMARKS ~~ID~~ ID 89135 20HRS AFTER STORM

G.H. OF ZERO FLOW ____ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
0930	BEFORE	0.93		0.93
1015	"	0.93		0.93
1021	START	0.92		0.92
1032	MID	0.92		0.92
1041	END	0.92		0.92
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
3.0	.15	0	Ø	Ø	0	0	0
3.3	.30	.33	70	40	1.75	.099	.173
3.6	.30	.52	66	40	1.65	.156	.257
3.9	.30	.63	67	40	1.675	.189	.317
4.2	.30	.63	50	40	1.25	.189	.236
4.5	.30	.63	52	40	1.30	.189	.246
4.8	.30	.61	49	40	1.225	.183	.224
5.1	.30	.60	83	40	2.075	.180	.374
5.4	.30	.67	134	40	3.35	.201	.673
5.7	.30	.73	99	40	2.475	.219	.542
6.0	.30	.60	50	40	1.25	.180	.225
6.3	.30	.42	14	40	0.35	.126	.044
6.6	.30	.25	19	40	0.475	.075	.036
6.9	.15	0	Ø	Ø	0	0	0
					1.345	1.986	3.347

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R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JF
CHECKED BY ______

STATION NAME FIRST CREEK - NORTH BOUNDARY - SW34004

DATE 89114 4/24, 19 89 PARTY JK, LB

WIDTH ~6.0 AREA - VEL. - G.H. NA DISCH. .142

a.5
90025 200 mm METHOD FLUME NO. SECS NA G.H. CHANGE NA IN 0 HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ______ FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW/UNIFORM WEATHER COOL, CLOUDY,

OTHER ______ AIR 65 °F@ 1020

GAGE NONE INSTALLED WATER 55 °F@ 1020

______ RECORD REMOVED ______ INTAKE FLUSHED U L

OBSERVER ______

CONTROL ______

REMARKS FLOW NOT STEADY, BACKING UP DUE TO SHALLOW BANKING STRUCTURE

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
	Q	USING	LONG-	THROATED	FLUME		
		-BANK	MAY	BE TO	LOW A	SLOPE	
		FOR	THIS	METHOD			
	U1						
TOT	- TOS	=	.900				
TOT	- TOW	=	.740				
	h =		.160				
	Q	=	.142	CFS			

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R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

ES 90025

MEASUREMENT NO. ______
COMPILED BY ______
CHECKED BY ______

STATION NAME 1ST CREEK @ NORTH PLANTS (SW30002)
DATE 89114 4/24, 19 89 PARTY JK, LB
WIDTH ~12 ft AREA — VEL. — G.H. NA DISCH. ______
METHOD 200 mm LONG THROATED FLUME NO. SECS NA G.H. CHANGE NA IN ____ HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ______ FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW - UNIFORM WEATHER COOL, CLEAR, LT WIND
OTHER ______ AIR 60 °F @ 1145
GAGE NONE INSTALLED WATER 50 °F @ 1145
______ RECORD REMOVED NA INTAKE FLUSHED U L NA
OBSERVER ______

CONTROL ______
REMARKS REEDS AND VEGETATION 10-15' UPSTREAM

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
	USED	LONG	THROATED		FLUME		
TOT	− TOS		=	0.900			
TOT	− TOW		=	0.580			
	h =			0.320			
	Q =		.4640 cfs				

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R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

DISCHARGE MEASUREMENT WITH BUCKET + TIMER. MEASURED JUST BELOW WEIR

MEASUREMENT NO. ______
COMPILED BY SEG
CHECKED BY ______

STATION NAME BASIN A 36001

89271

DATE SEPTEMBER 29, 1989 PARTY TG, SEG, GPP
WIDTH NA AREA NA VEL. NA G.H. .11 DISCH. ______

METHOD BUCKET/TIMER NO. SECS ______ G.H. CHANGE ______ IN ______ HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS NA % DIFF. FROM NA RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE ______ FEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW, UNIFORM WEATHER CLOUDY, SOMEWHAT BREEZY

OTHER ______ AIR ~65 °F @ 0925

GAGE STAFF, TYPE C (ON WEIR) WATER 62 °F @ 0925

RECORD REMOVED NO INTAKE FLUSHED U/L NO

OBSERVER ______

CONTROL METAL V NOTCH WEIR

REMARKS DISCHARGE TAKEN AT NOTCH OF WEIR

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

TIME ~~Distance from Initial Point~~	Width	Depth	Revolutions	Time ~~in~~ Seconds	Velocity	Area	VOL. ~~Discharge~~
0935	#1			43			4 GAL
	#2			47			4 GAL
	#3			45			4 GAL

discharge = ~~33.75 gpm~~ 7.11 gpm
= .185 gps
= ~~.0752 cfs~~
GPP 89279 = 0.0158 cfs

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START - 1435
FINISH - 1453

LEW - 2.00
REW - 6.00'

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DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. WY89#45 ~~#0~~ 88102
COMPILED BY JK
CHECKED BY

STATION NAME FIRST CREEK OFF-POST 37001

DATE 89097 4-7-1989 PARTY LB, JK
WIDTH 4.00' AREA 1.229 VEL. .232 G.H. .51 DISCH. .285

METHOD FLOW METER .6 NO. SECS 14 G.H. CHANGE Ø IN 1.0 HRS.

METER TYPE GURLEY #625 PYGMY CURRENT METER
SPIN BEFORE MEAS. 47 AFTER 49
MEAS. PLOTS ___ % DIFF. FROM ___ RATING
WADING UPSTR. ~~DOWNSTR.~~ SIDE BRIDGE 40 FEET MILE, ABOVE, BELOW GAGE, AND GH
OF 89098
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

FLOW LOW - MOD WEATHER WARM, WINDY, OVERCAST

OTHER ___ AIR 60° °F@ 1450

GAGE STAFF - FAIR COND WATER 50° °F@ 1450

RECORD REMOVED NONE INTAKE FLUSHED U L NO

OBSERVER

CONTROL H-FLUME / NOT WORKING - UNDERFLOW

REMARKS STREAM BOTTOM VERY SOFT, ROD SINKING

G.H. OF ZERO FLOW ___ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1435		NONE		0.51'
1447		NONE		0.51'
1453		NONE		0.51'
WEIGHTED M.G.H.				
G.H. CORRECTION		Ø		
CORRECT M.G.H.				0.51

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
2.00	.20	Ø	Ø	30	0.000	0.000	0.000
2.35	.30	.24	Ø	30	0.000	0.072	0.000
2.65	.30	.30	Ø	30	0.000	0.090	0.000
2.95	.30	.35	Ø	30	0.000	0.105	0.000
3.25	.30	.35	8	30	0.267	0.105	0.028
3.55	.30	.38	16	30	0.533	0.114	0.061
3.85	.30	.38	12	30	0.400	0.114	0.046
4.15	.30	.41	15	30	0.500	0.123	0.061
4.45	.30	.33	9	30	0.300	0.099	0.030
4.75	.30	.34	9	30	0.300	0.102	0.031
5.05	.30	.32	9	30	0.300	0.096	0.029
5.35	.30	.28	Ø	30	0.000	0.084	0.000
5.65	.30	.29	Ø	30	0.000	0.087	0.000
6.00	.20	.19	Ø	30	0.000	0.038	0.000
					0.232	1.229	0.285

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Location downstream [redacted]

LEW - ~~7.8~~ 3.7

WIDTH - ~~4.1~~ 3.9

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DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY ______
CHECKED BY ______

STATION NAME NORTH FIRST CREEK - OFFPOST 37001

DATE 8/9/10 ,19 87 PARTY L. Brouillard, H. Hedberg

WIDTH 4.1 AREA .705 VEL. 4.65 G.H. 0.52 DISCH. 0.308

METHOD .6 NO. SECS ~~39~~ 40 G.H. CHANGE 0 IN 1 HRS.

METER TYPE Pygmy Current Meter

SPIN BEFORE MEAS. 39 AFTER NONE

MEAS. PLOTS ______ % DIFF. FROM ______ RATING

WADING, UPSTR., DOWNSTR., SIDE BRIDGE 30 FEET, MILE, ~~ABOVE~~, BELOW GAGE AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW Low - uniform WEATHER WARM, BREEZY, ~80°F

OTHER ― AIR 80 °F@ 1645

GAGE Staff - no recorder WATER 50 °F@ 1645

RECORD REMOVED NA INTAKE FLUSHED U/L NA

OBSERVER NONE

CONTROL NONFUNCTIONAL H-FLUME

REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1648				0.52
1704				0.52
1714				0.52
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
3.7	.15	0 ~~.25~~	0	40	0.000	0.000	0.000
4.0	.30	.23 ~~.30~~	0	40	0.000	0.000	0.000
4.3	.30	.23	12	40	0.300	0.069	0.021
4.6	.30	.22	20	40	0.500	0.066	0.033
4.9	.30	.22	24	40	0.600	0.066	0.040
5.2	.30	.22	30	40	0.750	0.066	0.050
5.5	.30	.21	25	40	0.625	0.063	0.040
5.8	.30	.22	26	40	0.650	0.066	0.043
6.1	.30	.22	29	40	0.725	0.066	0.048
6.4	.30	.22	20	40	0.500	0.066	0.033
6.7	.30	.23	0	40	0.000	0.069	0.000
7.0	.30	.21	0	40	0.000	0.063	0.000
7.3	.30	.15	0	40	0.000	0.045	0.000
7.6	~~.30~~ .15	0	0	40	0.000	0.000	0.000
					4.65 ft/s	.705	0.308

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[illegible]T [illegible]10[illegible]
FINISH =

R. L. STOLLAR & ASSOCIATES
DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. ______
COMPILED BY JK
CHECKED BY ______

STATION NAME FIRST CREEK OFF-POST (37001)

DATE 89123 5/31, 19 89 PARTY JK, BS
WIDTH NA AREA ______ VEL. ______ G.H. ______ DISCH. ______

METHOD 200MM FLUME NO. SECS N/A G.H. CHANGE ______ IN ____ HRS.

METER TYPE N/A
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ______ % DIFF. FROM ______ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 40 FEET, MILE ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ______

FLOW LOW - UNIFORM WEATHER COOL, SL CLOUDY, LT WIND

OTHER ______ AIR 65° °F@ 1055

GAGE STAFF - GOOD SHAPE WATER 55° °F@ 1055

______ RECORD REMOVED ______ INTAKE FLUSHED U L ______

OBSERVER ______

CONTROL NONE - FLOW UNDER STATIONARY FLUME

REMARKS ______

G.H. OF ZERO FLOW ______ FT

GAGE READINGS				
TIME		RECORDER	INSIDE	OUTSIDE
1045		OOS		0.61
1054		OOS		0.51
1059		OOS		0.55
1104		OOS		0.56
1109		OOS		0.57
1114		OSS		0.58
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		OSS		

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
1054	h(2) = 0.30' ft / Q = .442						
1059	h(2) = 0.31 ft / Q = .4387						
1104	h(2) = 0.34 ft / Q = .5167						
1109	h(2) = 0.34 ft / Q = .5167						
1114	h(2) = 0.35 ft / Q = .5440						

TOT - TOS = 0.900

~~TOT~~ JK 89123

FINAL Q = 0.5440

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OSS = OUT OF SERVICE

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO.
COMPILED BY JK
CHECKED BY

STATION NAME FIRST CREEK OFF-POST

DATE 89194 7/13, 19 89 PARTY JK, TG, SW
WIDTH ____ AREA ____ VEL. ____ G.H. 0.58 DISCH. 0.0153

METHOD 100MM LT FLUME NO. SECS NA G.H. CHANGE Ø IN 1/2 (.5) HRS.

METER TYPE NA
SPIN BEFORE MEAS. NA AFTER NA
MEAS. PLOTS ____ % DIFF. FROM ____ RATING
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 10 FEET, MILE, ABOVE, BELOW GAGE, AND FLUME

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

FLOW VERY LOW-UNIFORM WEATHER WARM, MOSTLY SUNNY

OTHER ____ AIR 85 °F@ 1545

GAGE INSIDE STAFF - GOOD COND WATER 65 °F@ 1545

RECORD REMOVED EARLIER IN DAY INTAKE FLUSHED U L: NO

OBSERVER

CONTROL CEMENT FLUME

REMARKS STRUCTURE IN GOOD COND

G.H. OF ZERO FLOW 0.50 FT

GAGE READINGS

TIME		RECORDER	INSIDE	OUTSIDE
1540		0.58	0.58	
1550		0.58	0.58	
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
					Tot		0.49
					.+05		
Time		h	1st Tow	~~Q~~			
1540		0.06	0.43	0.0153			
1545		0.06	0.43	0.0153			
1549		0.06	0.43	0.0153			

Final Q = 0.0153

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APPENDIX A-3

Rating Curves

APPENDIX A-3.1

Rating Curve Development Procedures

Appendix A-3.1 Rating Curve Development Procedures

Channel Control Rating Development. - The development of the rating curve for a channel control station would normally use a graphical analysis of discharge measurements plotted on logarithmic graph paper. Upon review of the discharge measurements, made prior to the 1989 water year, for the only channel control station, Havana Interceptor, all were rejected as unreliable for rating curve development. Therefore, the following analysis was performed to derive a rating curve for Havana Interceptor:

- A normal depth hydraulic analysis was performed using HEC-2 to predict gage height and corresponding discharges from channel geometry.

- The predicted discharges and gage heights were plotted on logarithmic paper. The discharge was on the ordinate and the gage height was on the abscissa.

- A curve of connected straight-line segments was visually fitted through the plotted points.

- Endpoint coordinates of each straight-line segment were determined from the rating curve plot. A rating equation was derived in the form of a power curve (Rantz 1982).

  The rating equation was of the form

$$Q = pG^N$$

where

Q = discharge in cubic feet per second (cfs);
G = the gage height of the water surface in feet;
p = regression coefficient (dimensionless); and
N = regression coefficient (dimensionless), generally not equal to p.

Two different criteria were used to confirm the permanence and/or follow shifts in the rating curve for Havana Interceptor. These criteria are as follows:

- Instantaneous discharge measurements made during the 1989 water year must be within ± 5 percent of the rating curve discharge corresponding to the same gage height in order to confirm the permanence of the rating curve.

- For low-flow measurements, the ± 5 percent criteria may be too stringent because of station control insensitivity; therefore, departures greater than ± 5 percent are

acceptable and confirm the permanence of the rating curve if the indicated shift in stage does not exceed 0.02 feet.

A detailed analysis of each instantaneous discharge measurement made during the 1989 water year at this station is presented in Appendix A-5.

Section Control Rating Development. - Laboratory-rated discharge-measurement structures have been installed at seven RMA stations (Highline Lateral, Ladora Weir, Basin A, South First Creek, North First Creek, First Creek Off-post, and South Plants Ditch). These structures provide section control for the complete range of stages falling within the capacity of each structure. Each artificial control stabilizes and constricts the channel at a section, and thereby simplifies the procedure for obtaining accurate records of discharge. Although these structures have been built in conformance with the dimensions of laboratory-rated weirs or flumes (the relationship of stage to discharge has been carefully measured under controlled conditions) differences between the model and prototype invariably exist, if only in approach-channel conditions (Rantz 1982). Therefore, instantaneous discharge measurements were made at artificial section control stations to verify the rating curves prepared for the respective model structures.

It should be emphasized that the primary purpose of the weir structures, and the triangular-throated flume at the First Creek Off-post station, was to measure flows within the capacity of the structures. Therefore, no attempt was made to determined the relationship of stage to discharge for stages and flows exceeding the capacity of the artificial section controls.

The laboratory rating for each structure was plotted along with the discharge measurements to discharge if a correlation existed. These laboratory ratings are based on depth of water above the zero-reference of the structure. Since the field-measured staff gage heights do not generally equal the water depths above the zero-reference of the structures, an offset was subtracted from each staff gage height to obtain the plotted depth value. This offset (e) is the gage height (in feet) corresponding to zero flow for the existing control. If the discharge measurements consistently plotted on the empirical rating curve, the empirical curve was used. For stations at RMA requiring modification of the empirical ratings, the verified stage-discharge measurements were plotted, and connected straight-line segments were fit to the plotted points. Regression analysis to fit a power curve was performed as previously described (Channel Control Rating Development) to obtain a calibrated rating curve and rating equations for the existing condition of each structure. For the stations where zero on the staff gage does not correspond to zero flow, the rating equation will be of the form

$$Q = p(G-e)^N$$

where

Q = discharge in cubic feet per second (cfs);

(G-e) =head or depth of water on the control in feet;

G = the gage height of the water surface in feet;

e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;

p = regression coefficient (dimensionless); and

N = regression coefficient (dimensionless), generally not equal to p.

Confirmation of the permanence of these rating curves followed the same criteria as previously described in Section 3.1.2.6, Rating Curve Development Procedures; and in this Appendix, Channel Control Rating Development.

The development of the rating curve for South First Creek followed the normal graphical analysis of instantaneous discharge measurements. The reliable instantaneous discharge measurements were plotted on logarthmic graph paper with the discharge on the ordinate and the corresponding gage height on the abscissa. A curve of connected straight-line segments was visually fitted through the plotted points. Endpoint coordinates of each straight-line segment were determined from the rating curve plot. Regression analysis to fit a power curve was performed, as previously described (channel control rating development), to obtain a calibrated rating curve and equations for the existing condition of the structures. The rating curve required extrapolation beyond the range defined by discharge measurements for low flows. A table of gage height and discharge was generated by using the rating equation in the defined region for the lowest flows. These points were plotted on rectangular-coordinate graph paper along with the gage height of zero flow, and a smooth curve was drawn to merge the point of zero flow with the defined range of points (Rantz 1982). Several points from this extrapolated curve below the defined segment were transferred onto the logarithmic paper. Straight-line segments were connected between selected extrapolated points and equations were derived for the segments as previously described.

Upon review of the four instantaneous discharge measurements made at the North First Creek gaging station, only one was accepted as reliable for rating curve development. Therefore, the following analysis was performed to derive a rating curve for this station:

- A normal depth hydraulic analysis was performed using HEC-2 to predict gage height and corresponding discharges from channel geometry.

- The predicted discharges and gage heights were plotted on logarthmic graph paper, along with the one reliable discharge measurement.

- A curve of connected straight-line segments was visually fit through the plotted points.

- Endpoint coordinates of each straight-line segment were determined from the rating curve plot and regression analysis to fit a power curve, as previously described (channel control rating development).

A detailed analysis of each instantaneous discharge measurement made during the 1989 water year at each of these stations is presented in Appendix A-5.

Compound Control Rating Development. - The development of rating curves for the compound control stations (South Uvalda, North Uvalda, and Peoria Interceptor) utilized a procedure that was a combination of the procedures delineated in the previous two station control sections (section control and channel control). Additional considerations included the following:

- Discharge measurements were evaluated to determine if the measured discharges and corresponding staff readings could occur theoretically. This evaluation was conducted using HEC-2 to simulate the channel hydraulics. Discharge measurements that appeared invalid based upon the HEC-2 analysis were not used in the rating curve development.

- The rating curves required extrapolation beyond the range defined by discharge measurements for high flows. An analysis was performed using HEC-2 to determine if the transition from section control to channel control had occurred at the highest recorded stage. In all cases, this transition had not occurred. Further analysis demonstrated that it was inappropriate to use HEC-2 for the high flow extrapolation.

  A hydraulic analysis using HEC-2 was attempted to predict the higher flows. (Note however, that these higher flows are section controlled.) This was done by assuming critical depth at the control section and that normal depth would then occur at the gage section. The present stations were constructed such that there is insufficient distance between the gage section and the control section. The result is that normal depth occurs upstream of the gage section, therefore, yielding an unrealistic result.

- The high flow extrapolation was done using the Manning equation:

  $$Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$$

  where

Q = discharge (cfs);

n = Manning's channel roughness coefficient (dimensionless);

A = cross-sectional area (ft^2);

R = hydraulic radius = $\frac{A}{P}$;

P = wetted perimeter (ft); and

S = slope (ft/ft).

The cross-section geometry corresponding to the maximum recorded gage height was plotted from reach survey data to determine the cross-sectional area and wetted perimeter at the location of the staff gage. The slope of the corresponding stream surface energy gradient was not available. Since average streambed slope typically approaches the energy gradient at the higher stages (Rantz 1982), the average streambed slope was computed from contour maps or reach survey data for input to Manning's equation. The channel roughness coefficient, n, was determined from stage-discharge measurements and field observations of streambed and bank cover conditions. The calculated discharge was plotted on logarithmic paper and regression analysis was performed on this line segment as previously described.

Confirmation of the permanence of these rating curves followed the same criteria as previously described. A detailed analysis of each instantaneous discharge measurement made during the 1989 water year at each of these stations is presented in Appendix A-5.

APPENDIX A-3.2

Gage Height vs. Discharge

APPENDIX A-3.3

Head vs. Discharge

APPENDIX A-4

Rating Equations

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW01001, NORTH UVALDA

DESCRIPTION: BROAD CRESTED CONCRETE WEIR

EQUATION FORM: $Q = p(G-e)^N$

where: Q = Discharge in cubic feet per second;
$(G-e)$ = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;
e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
p = regression coefficient (dimensionless); and
N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	End Date
-0.104 to -0.060	0.882177764	1.444590283	-0.105	10-01-88	09-30-89
-0.059 to 0.000	1.597817538	1.636135791	-0.105	10-01-88	09-30-89
0.001 - 0.015	0.118589583	0.205644337	0.00	10-01-88	09-30-89
0.016 - 0.03	0.184078048	0.310340083	0.00	10-01-88	09-30-89
0.04 - 0.05	0.356680281	0.498980945	0.00	10-01-88	09-30-89
0.06 - 0.09	0.631774902	0.689816811	0.00	10-01-88	09-30-89
0.10 - 0.15	2.323074133	1.230573848	0.00	10-01-88	09-30-89
0.16 - 0.20	5.667685192	1.700702010	0.00	10-01-88	09-30-89
0.21 - 0.515	12.65759878	2.199930256	0.00	10-01-88	09-30-89
0.516 - 0.975	14.63974813	2.419166422	0.00	10-01-88	09-30-89
0.976 - 2.00	14.95376940	3.257434047	0.00	10-01-88	09-30-89
2.01 - 2.54	45.64969387	1.647337806	0.00	10-01-88	09-30-89

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW01003, SOUTH PLANTS DITCH

DESCRIPTION: 90 DEGREE V-NOTCH WEIR PLATE

EQUATION FORM: $Q = p(G-e)^N$

where: Q = Discharge in cubic feet per second;
(G-e) = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;
e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
p = regression coefficient (dimensionless); and
N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	End Date
3.43 - 3.62	(1)	(1)	3.43	10-01-88	09-30-89
3.63 - 3.80	2.488803337	2.481549685	3.43	10-01-88	09-30-89
3.80 - 5.43 (2)	33.30000000	1.500000000	3.80	10-01-88	09-30-89

(1) For gage heights between 3.43 ft and 3.62 ft which corresponds to heads of 0.00 ft and 0.19 ft, use the given coefficients for the gage height range of 3.63 ft - 3.80 ft. Note that the flow can only be estimated in the low-flow range due to the fact that the nappe may not spring free of the crest when the head is less than 0.2 ft.

(2) For gage heights above 3.80 ft use the coefficients given to compute a flow. To this add 0.21 cfs, the maximum flow through the V-notch. Note that the flow can only be estimated in this range above 3.80 ft.

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW02001, LADORA WEIR

DESCRIPTION: 2-INCH-WIDE PLANKS FITTED ON TOP OF A CONCRETE WALL

EQUATION FORM: $Q = p(G\text{-}e)^N$

where: Q = Discharge in cubic feet per second;
(G-e) = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;
e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
p = regression coefficient (dimensionless); and
N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	Valid Period End Date
4.13 - 4.32	(1)	(1)	4.13	10-01-88	09-30-89
4.13 - 6.13	19.98000000	1.500000000	4.13	10-01-88	09-30-89

(1) For gage heights between 4.13 ft and 4.32 ft, which corresponds to heads of 0.0 ft and 0.19 ft, use the given coefficients for the gage height range of 4.33 ft - 6.13 ft. Note that the flow can only be estimated in the low-flow range due to the fact that the nappe may not spring free of the crest when the head is less than 0.2 ft.

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW08003, SOUTH FIRST CREEK

DESCRIPTION: CONCRETE COMPOUND WEIR

EQUATION FORM: $Q = p(G\text{-}e)^N$

where:
- Q = Discharge in cubic feet per second;
- $(G\text{-}e)$ = head or depth of water on the control in feet;
- G = the gage height of the water surface in feet;
- e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
- p = regression coefficient (dimensionless); and
- N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	Valid Period End Date
0.03 - 0.12	0.274865251	1.562869813	0.00	10-01-88	09-30-89
0.13 - 0.20	30.32336677	3.781175623	0.00	10-01-88	09-30-89
0.21 - 1.38	4.970971764	2.657613623	0.00	10-01-88	09-30-89

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW11001, PEORIA INTERCEPTOR

DESCRIPTION: FLAT CRESTED WEIR WHICH CONSISTS OF A NARROW PLANK POSITIONED PERPENDICULAR TO FLOW. CHANGED TO A 90 DEGREE V-NOTCH WEIR ON APRIL 14, 1989.

EQUATION FORM: $Q = p(G-e)^N$

where:
- Q = Discharge in cubic feet per second;
- $(G-e)$ = head or depth of water on the control in feet;
- G = the gage height of the water surface in feet;
- e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
- p = regression coefficient (dimensionless); and
- N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	End Date
1.04 - 1.06	3.640718E-12	436.7207643	0.00	10-01-88	04-07-89
1.07 - 1.12	0.051158789	35.71755364	0.00	10-01-88	04-07-89
1.13 - 1.29	1.202206920	7.860705838	0.00	10-01-88	04-07-89
1.30 - 4.32	5.407527455	1.955820912	0.00	10-01-88	04-07-89
0.404 - 0.50	0.236237085	1.280211429	0.39	04-14-89	09-30-89
0.51 - 0.59	1.131299766	1.989813381	0.39	04-14-89	09-30-89
0.60 - 1.05	2.488803337	2.481549685	0.39	04-14-89	09-30-89
1.051 - 1.06	0.123984198	40.32966282	0.00	04-14-89	09-30-89
1.07 - 1.12	0.415469558	19.57665310	0.00	04-14-89	09-30-89
1.13 - 1.29	1.795908698	6.659737538	0.00	04-14-89	09-30-89
1.30 - 4.32	6.058487140	1.884610242	0.00	04-14-89	09-30-89

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW11002, HAVANA INTERCEPTOR

DESCRIPTION: CONCRETE LINED TRAPEZOIDAL CHANNEL

EQUATION FORM: $Q = p(G-e)^N$

where:
- Q = Discharge in cubic feet per second;
- $(G-e)$ = head or depth of water on the control in feet;
- G = the gage height of the water surface in feet;
- e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
- p = regression coefficient (dimensionless); and
- N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	End Date
0.01 - 0.025	2.000000126	1.000000012	0.00	10-01-88	09-30-89
0.026 - 0.10	2.364864829	1.045426716	0.00	10-01-88	09-30-89
0.11 - 0.175	2.305695547	1.034422377	0.00	10-01-88	09-30-89
0.176 - 0.24	4.725356666	1.446111016	0.00	04-25-89	09-30-89
0.25 - 0.32	23.80114393	2.579018353	0.00	04-25-89	09-30-89
0.33 - 1.39	20.86833977	2.463609783	0.00	04-25-89	09-30-89
1.40 - 1.91	21.46649374	2.377791962	0.00	04-25-89	09-30-89
1.92 - 4.14	8.454697601	3.817702957	0.00	04-25-89	09-30-89
0.176 - 4.14	3.276612758	1.236048284	0.00	10-01-88	04-25-89

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW12005, SOUTH UVALDA

DESCRIPTION: V-NOTCH IN A 12 INCH WIDE CONCRETE WEIR

EQUATION FORM: $Q = p(G-e)^N$

where: Q = Discharge in cubic feet per second;
$(G-e)$ = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;
e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
p = regression coefficient (dimensionless); and
N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	End Date
3.428 - 3.57	4.315263E-29	48.79427888	0.00	10-01-88	09-30-89
3.58 - 3.84	1.627457E-16	26.03831775	0.00	10-01-88	05-08-89
3.85 - 4.31	7.204057E-14	21.50994769	0.00	10-01-88	05-08-89
4.32 - 4.82	0.000700004	5.768606020	0.00	10-01-88	05-08-89
4.83 - 4.92	1.199150E-29	43.49109493	0.00	10-01-88	09-30-89
4.93 - 5.10	6.693750E-10	14.95383007	0.00	10-01-88	09-30-89
5.11 - 8.00	0.014836562	4.572277074	0.00	10-01-88	09-30-89
3.58 - 4.06	1.931987E-19	31.33173826	0.00	05-09-89	09-30-89
4.07 - 4.82	0.000653393	5.812418902	0.00	05-09-89	09-30-89

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW12007, HIGHLINE LATERAL

DESCRIPTION: CIPPOLETTI WEIR

EQUATION FORM: $Q = p(G\text{-}e)^N$

where: Q = Discharge in cubic feet per second;
(G-e) = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;
e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
p = regression coefficient (dimensionless); and
N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	Valid Period End Date
0.01 - 0.04	5.999999825	0.999999995	0.00	10-01-88	09-30-89
0.05 - 0.09	11.77702045	1.209511252	0.00	10-01-88	09-30-89
0.10 - 0.20	15.97301939	1.336071751	0.00	10-01-88	09-30-89
0.21 - 0.33	26.14011331	1.642122716	0.00	10-01-88	09-30-89
0.34 - 1.00	54.66181761	2.307513945	0.00	10-01-88	09-30-89

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW24002, NORTH FIRST CREEK

DESCRIPTION: CONCRETE COMPOUND WEIR

EQUATION FORM: $Q = p(G\text{-}e)^N$

where:
- Q = Discharge in cubic feet per second;
- (G-e) = head or depth of water on the control in feet;
- G = the gage height of the water surface in feet;
- e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
- p = regression coefficient (dimensionless); and
- N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	Valid Period End Date
0.084 - 0.25	4.547328047	2.470675002	0.00	10-01-88	09-30-89
0.26 - 1.24	3.522261553	2.286416481	0.00	10-01-88	09-30-89
1.25 - 1.70	3.174816454	2.769205688	0.00	10-01-88	09-30-89

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW36001, BASIN A

DESCRIPTION: 90 DEGREE V-NOTCH WEIR PLATE

EQUATION FORM: $Q = p(G-e)^N$

where: Q = Discharge in cubic feet per second;
(G-e) = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;
e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
p = regression coefficient (dimensionless); and
N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	Valid Period End Date
0.07 - 0.26	(1)	(1)	0.07	10-01-88	09-30-89
0.27 - 1.32	2.488803337	2.481549685	0.07	10-01-88	09-30-89

(1) For gage heights between 0.07 ft and 0.26 ft which corresponds to heads of 0.0 ft and 0.19 ft use the given coefficients for the gage height range of 0.27 ft - 1.32 ft. Note that the flow can only be estimated in the low-flow range due to the fact that the nappe may not spring free of the crest when the head is less than 0.2 ft.

STAGE-DISCHARGE RATING EQUATIONS

STATION: SW37001, FIRST CREEK OFF POST

DESCRIPTION: CONCRETE TRIANGULAR-THROATED FLUME

EQUATION FORM: $Q = p(G\text{-}e)^N$

where:
- Q = Discharge in cubic feet per second;
- (G-e) = head or depth of water on the control in feet;
- G = the gage height of the water surface in feet;
- e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
- p = regression coefficient (dimensionless); and
- N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range (ft)	p	N	e (ft)	Valid Period Begin Date	Valid Period End Date
0.50 - 0.54	0.124999989	0.999999979	0.50	06-15-89	09-30-89
0.55 - 0.59	1.226773025	1.709511275	0.50	06-15-89	09-30-89
0.60 - 0.75	4.306533142	2.231012279	0.50	06-15-89	09-30-89
0.76 - 2.50	6.853180828	2.566146561	0.50	06-15-89	09-30-89

APPENDIX A-5

Comparison of Instantaneous Discharge
Versus Computed Discharge

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE
NORTH UVALDA (SW01001)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100* [(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
			No instantaneous discharge measurements were made during the 1989 water year at this station.								

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE
SOUTH PLANTS DITCH (SW01003)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100* [(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
			No instantaneous discharge measurements were made during the 1989 water year at this station.								

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE
LADORA WEIR (SW02001)

(1) Meas- urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan- taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100* [(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
			No instantaneous discharge measurements were made during the 1989 water year at this station.								

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE *
SOUTH FIRST CREEK (SW08003)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100* [(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
1	04/07/89	1130,1205	0.49	---	0.59	0.75	-21.3	0.45	0.04		RLSA, Pygmy #625, downstream 25'
2	04/12/89	1536,1647	0.58	---	1.1	1.1	0.0	0.57	0.01	X	RLSA, Pygmy #625, downstream 45' below gage
3	04/25/89	1000,1042	0.47	---	0.72	0.67	7.5	0.48	-0.01	X	RLSA, 200mm flume, downstream 40' below gage
4	05/03/89	0915,0935	0.50	---	0.86	0.79	8.9	0.52	-0.02	X	RLSA, 200mm flume, downstream 40' below gage
5	05/05/89	1020,1110	1.23	---	9.2	8.6	7.0	1.26	-0.03	X	RLSA, Pygmy #625, downstream 40' below gage
6	06/20/89	1228,1245	0.48	---	0.69	0.71	-2.8	0.48	0.00	X	RLSA, 200mm flume, downstream 30' below gage
7	07/20/89	1335,1343	0.13	---	0.01	0.01	0.0	0.12	0.01	X	RLSA, 100mm flume, downstream 30' below gage
8	09/26/89	1440,1450	0.22	---	0.10	0.09	11.1	0.23	-0.01	X	RLSA, 100mm flume, downstream 30' below weir
9	09/29/89	1235,1246	0.20	---	0.06	0.07	-14.3	0.19	0.01	X	RLSA, 100mm flume, downstream 30' below weir

* Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE *
PEORIA INTERCEPTOR (SW11001)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100* [(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
1	04/26/89	1116,1125	0.72	---	0.13	0.16	-18.8	0.30	0.03		RLSA, Long throated flume, downstream 30' below gage
2	07/20/89	1710,1727	0.69	---	0.16	0.13	23.1	0.33	-0.03		RLSA, 200mm flume, downstream 30' below gage
3	09/27/89	0845,0900	0.70	---	0.05	0.14	-64.3	0.21	0.10		RLSA, 100mm flume, downstream 100' below gage

* Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE *
HAVANA INTERCEPTOR (SW11002)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100*[(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
1	04/11/89	1515,1545	0.52	N/A	1.5	N/A	N/A	N/A	N/A		RLSA, Pygmy #625, downstream 8' below bubble line
2	04/26/89	1330	0.24**	0.29	0.37	0.60	-38.3	0.17	0.07		RLSA, Pygmy #625, 10' above gage
3	07/20/89	1630,1655	0.18**	0.23	0.37	0.40	-7.5	0.17	0.01	X	RLSA, 200mm flume, downstream 350' below gage
4	09/27/89	1020,1030	0.19**	0.24	0.49	0.43	14.0	0.21	-0.02	X	RLSA, 200mm flume, downstream 500' below gage

* Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

** Computed by (New Gage - 0.05 offset)

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE *
SOUTH UVALDA (SW12005)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100* [(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
1	03/21/89	1520,1547	3.85,3.85	---	0.26	0.28	-7.1	3.84	0.01	X	RLSA, Pygmy #625, downstream 50' below gage
2	03/21/89	1544,1613	3.85,3.85	---	0.30	0.28	7.1	3.85	0.00	X	RLSA, Pygmy #625, downstream 50' below gage
3	04/17/89	1203,1331	3.82,3.81	---	0.35	0.22	59.1	3.88	-0.06		RLSA, Pygmy #625, downstream 50' below gage
4	04/21/89	1525,1535	3.84,3.84	---	0.26	0.27	-3.7	3.84	0.00	X	RLSA, Long throated flume, downstream 30' below gage
5	06/20/89	1330,1349	3.88,3.88	---	0.54	0.54	0.0	3.88	0.00	X	RLSA, 200mm flume, downstream 40' below gage
6	09/26/89	0910,0920	3.83**	0.51	0.30	0.36	-16.7	3.81	0.02	X	RLSA, 200mm flume, downstream 30' below gage
7	09/29/89	1515,1515	3.82**	0.50	0.17	0.33	-48.5	3.74	0.08		RLSA, 200mm flume, downstream 50' below gage

* Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

** Computed by (New Gage + 3.32 offset)

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE
HIGHLINE LATERAL (SW12007)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100*[(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
			No instantaneous discharge measurements were made during the 1989 water year at this station.								

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE *
NORTH FIRST CREEK (SW24002)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100* [(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
1	04/06/89	1510,1530	0.47,0.47	---	0.32	0.63	-49.2	0.35	0.12		RLSA, Pygmy #625, downstream 40' below gage
2	04/21/89	1056,1128	0.46,0.47	---	0.31	0.60	-48.3	0.35	0.11		RLSA, Pygmy #625, downstream 35' below gage
3	05/03/89	1005,1030	0.52,0.52	---	0.79	0.79	0.00	0.52	0.00	X	RLSA, 200mm flume, downstream 30' below gage
4	05/15/89	0930,1041	0.93,0.92	---	3.4	3.0	13.3	0.98	-0.05		RLSA, Pygmy #625, downstream 30' below gage

* Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE
BASIN A (SW36001)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100* [(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
			No instantaneous discharge measurements were made during the 1989 water year at this station.								

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE *
FIRST CREEK OFF-POST (SW37001)

(1) Meas-urement Number	(2) Date	(3) Start, Stop Time (hrs)	(4) Old Start, Stop Gage Height (feet)	(5) New Start, Stop Gage Height (feet)	(6) Instan-taneous Discharge (cfs)	(7) Computed Discharge (cfs)	(8) =100* [(6)-(7)]/(7) Difference in Discharge (%)	(9) Computed Gage ht. (ft.)	(10)=(4)-(9) Difference in Gage ht. (ft.)	(11) Measurements used for Rating Curve Development	(12) Comments
1	04/07/89	1435,1453	0.51	---	0.29	N/A	N/A	N/A	N/A		RSLA, Pygmy #625, upstream 40' above gage
2	04/20/89	1648,1714	0.52	---	0.31	N/A	N/A	N/A	N/A		RSLA, Pygmy #625, upstream 30' above gage
3	05/03/89	1045,1114	0.61,0.58	---	0.54	N/A	N/A	N/A	N/A		RLSA, 200mm flume, upstream 40' above gage
4 **	07/13/89	1546,1550	---	0.58	0.02	0.02	0.0	0.09	---	X	RLSA, 100mm flume, downstream 10' below gage

* Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

** New control structure installed June 1989.

APPENDIX A-6

Continuous Gage Height Recorders
Equipment and Procedures

APPENDIX A-6.1

Stevens Type F Equipment Specifications
and Procedures

A-6.1 Stevens Type F Recorder Procedures

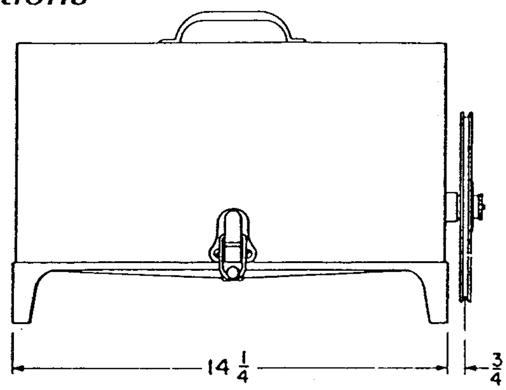
During Water Year 1989 there were eleven surface water stations equipped with Stevens Type F water level recorders. The Stevens Type F recorders currently in use are Model 68's equipped with quartz multispeed timers and either multiple D-cell batteries or a single mercury battery power source. The Stevens Type F recorder is attached to a float, beaded wire, and pulley. Changing water levels in the stilling well cause the float to rise and fall which turns the recorder's drum proportionally. The quartz multispeed timer moves a pen across the strip chart at a uniform speed. The resulting record produced is a graph of water level versus time.

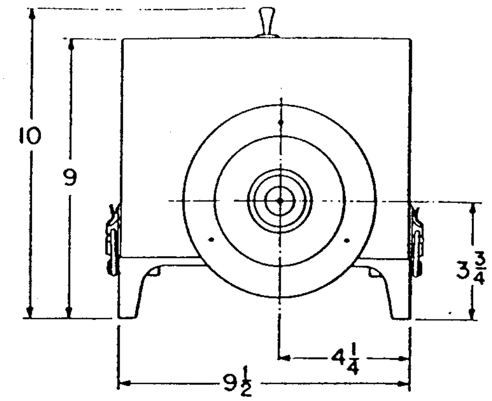
Weekly activities at the continuous monitoring stations included collecting and replacing strip charts, checking recorder operation, calibrating strip charts to the outside observed stage and initial time, and removing obstructions from stilling wells, channel sections and control structures. Freezing conditions prohibited the use of the recorders from late November 1988 through February 1989. Stage data is invalid during periods of freezing because the frozen water in the stilling well incapacitates the recorder's float and pulley system.

The strip chart analog stage data were reduced to a digitized format using the computer program CPSPC (Radian Corp., October 1987, Version 3.1) in conjunction with a digitizer. After a strip chart has been digitized, the software program transforms the digital file into units used by the analog record. In this case, the scale was correlated to Julian date and scientific hours for time and to 0.01 ft for gage height. The minimal digitized strip chart points chosen were 0.00, 12.00, and 24.00 for each record day. Other significant stage points selected for digitization were high flow events, when gage heights were digitized at a minimum of 15 minute intervals, and any stage points that exhibited 0.1+ ft of deflection within any 2 hour period. Finally, the digitized stage output was compared to the strip chart analog record and corrected to the observed staff gage settings.

STEVENS TYPE F Water-level Recorder

Specifications





GAGE SCALES ADAPT RECORDER TO WATER-LEVEL RANGE

The relationship between the rotation of the float pulley and the chart drum is set by gearing. Changes in the gearing, or the pulley circumference, thus affect the ratio between the chart *record* and *water-level* changes. This ratio is known as *gage scale*.

To make a field change from any scale listed in the Table, *below*, (except 1:20 and 1:24) to another, requires only the substitution of a pair of gears. The 1:20 and 1:24 scales are obtained by installing the 750mm. or 36 in. circumference ring on the float pulley of a Recorder geared for the 1:10 or 1:12 scales, respectively.

Table 3

GAGE SCALES FOR STEVENS TYPE F RECORDER (obtained by gearing)

Gage Scale	*Water Level Change for 1 Rev. of Drum*	*Value of Smallest Chart Division*		*Float Pulley Required*
English Decimal System—		*F1/F2*	*F3 Chart*	
1:1	1.0 ft.	.01 ft.	.1 in.	18 in. circ.
1:2	2.0 ft.	.02 ft.	.2 in.	18 in. circ.
1:5	5.0 ft.	.05 ft.	.5 in.	18 in. circ.
1:10	10.0 ft.	.10 ft.	1.0 in.	18 in. circ.
1:20	20.0 ft.	.20 ft.	2.0 in.	36 in. circ.
English Duo-Decimal System—		*F3 Chart*		
10:12	1.2 ft.	.01 ft.		18 in. circ.
5:12	2.4 ft.	.02 ft.		18 in. circ.
1:6	6.0 ft.	.05 ft.		18 in. circ.
1:12	12.0 ft.	.10 ft.		18 in. circ.
1:24	24.0 ft.	.20 ft.		36 in. circ.
Metric System—		*F4 Chart*		
1:1	0.3 m.	2 mm.		375 mm. circ.
1:2	0.6 m.	4 mm.		375 mm. circ.
1:5	1.5 m.	10 mm.		375 mm. circ.
1:10	3.0 m.	20 mm.		375 mm. circ.
1:20	6.0 m.	40 mm.		750 mm. circ.

NOTE: Range is unlimited since the chart drum may make any number of revolutions.

Leupold & Stevens, Inc.

P.O. Box 688 Tel. 503 646-9171

Beaverton, Oregon 97005 U.S.A. • Cable LEUSTEV, Beaverton.

Basic Type F Recorder Specifications

Float operated water level recorder with horizontal ball bearing chart drum; rectangular chart 12 inches (or 30 cm) x 9.6 inches; capillary pen with Lucite reservoir; 1 oz. black ink; 4 legged cast aluminum base for shelf or table mounting; metal cover without port.

APPLICATION OPTIONS:

Type of pen drive:

- ☐ 8 day spring driven clock
- ☐ 30 day weight driven clock
- ☐ synchronous motor for ___V, ___Hz
- ☐ battery driven clock, 1.5 VDC

Time scale:

_________ (refer to Table 1 for availability)

Gage scale:

_________ (refer to Table 3 for availability)

Chart:

☐ F1 ☐ F3 ☐ F7
☐ F2 ☐ F4 ☐ F8

Float Pulley:

- ☐ 18 in. or 375 mm circumference for
  ☐ beaded float line ☐ perforated tape
- ☐ 36 in. or 750 mm pulley ring for 1:20 and 1:24 gage scales

Float line/tape:

- ☐ _________feet stainless steel float line with set end hooks
- ☐ _________feet stainless steel perforated and graduated float tape with set end hooks and index bracket

Float with counterweight:

☐ 2½ in. ☐ 5 in.
☐ 3 in. ☐ 6 in.
☐ 3½ in. ☐ 7 in.
☐ 4 in. ☐ 8 in.

Accessories:

- ☐ Scow float with adjustable anchor rod and counterweight
- ☐ Automatic clock starter (for 8 day clock only)
- ☐ Cover with viewing port
- ☐ Pencil stylus (in place of pen)

Note: See Price List for options available. Manufacturer reserves the right to make changes in design or materials for product improvement, without notice.

Litho In U.S.A.

10M-773-D&D

APPENDIX A-6.2

Datapod Equipment Specifications and Procedures

A-6.2 DP115 Datapod Procedures

The Omnidata International, Inc. model DP115 datapod, equipped with a 10-turn potentiometer, operates in conjunction with the Stevens Type F recorder. Data collected by the DP115 is used to obtain digital stage measurements in conjunction with the Stevens recorder.

Proper setup of the DP115 datapod requires that two recording functions are set:

- Resolution (stage change required to record a data point); and
- Sampling time interval.

The recording functions are set on the datapod using the control switches located on the inside panel. Switches 1 and 2 control resolution, and switches 3 and 4 control sampling interval. A resolution of 0.01 ft and a sampling interval of 30 minutes is set on the data pod. The datapod will record a change in stage of 0.01 ft or greater at 30 minute intervals, however, if the stage change is less than 0.01 ft the datapod does not record a data point. This function allows the datapod to conserve space on the data storage module (DSM). A stage data point is also recorded when the unit is powered up and will record a data point at 24 hour intervals regardless of any change in stage.

The datapod's DSM is changed monthly along with the units batteries. Data "short dumps" are acquired weekly and recorded in the log book. The following procedures are used to acquire the "short dump" and to change the DSM and batteries on the datapod.

Procedure:

Note: **** indicates that a display has to be recorded in the log book.**
[] indicates a display that will appear on the DP115.

1. **RECORD station number in the log book.
2. **RECORD the DP115 serial number on the log book.
3. **RECORD the display message [RUN] in the log book: Display.
4. Loosen the four screws on the face plate and separate the face plate from the case. (do not remove screws if only a short dump is being acquired.)

SHORT DUMP

Note: **The DP115 will advance through the following sequence fairly quickly. If a display is missed, the sequence can be reinitiated by pressing the button on the outer case after the last display [RUN] is shown.**

5. Push the button on the outer case -

[DLY] will be displayed, then -

[CHN1] will be displayed, then -

a number will be displayed indicating the current stream stage.

**RECORD the number with the label: CHN1

[ERR] will be displayed, then -

a number indicating the number of errors will be displayed.

**RECORD this number with the label: ERR

[TIME] will be displayed, then -

a number indicating the time (relative to startup) will be displayed.

**RECORD this number with the label: TIME

[DSM USED] will be displayed, then -

a number will be displayed indicating the amount of data storage modules space so far.

**RECORD this number with the label: DSM USED

[RUN] will be displayed indicating the DP115 is finished with the short dump.

Note: continue procedures only if DSM and batteries are to removed.

Caution: There is a 24- hour clock in the DP115 that displays time to the nearest tenth hour.

Example: When the [TIME] display reads XXX.1, the DP115 has advanced 6 minutes into the hour.

The DP115 clock begins as soon as the last battery is inserted.

The DP115 is set to make a stream gage recording every 30 minutes. A 30 minute interval will be denoted on the [TIME] display as XXX.0 or XXX.5. If it is getting close to a recording interval such as XXX.4 or XXX.9, wait until after the reading has been make and then continue. (The LED will flash when a reading is being taken.)

6. Remove a battery from the battery pack to power down the DP115.
7. **RECORD the time of day with the label: Stop Time.
8. **RECORD the staff gage reading with the label: Staff Gage (ft).

Caution: **Be sure your fingers are clean and dry before touching the DSM. Care should be taken no to touch any of the pins on the DSM.**

9. Remove the DSM from the back of the face plate by gently pulling it straight up and place it in the protective container with the pins on the DSM inserted into the anti-static foam in the plastic storage container.

POWER UP

10. Replace the battery removed (or replace all batteries) to power up the DP115.

11. [DATA POD 115] will appear in the display window, then -

12. [SAM] will appear in the display window, then -
    a number indicating the sample interval.
    **RECORD this number with the label: SAM.

13. [RES] will appear in the display window, then -
    a number indicating the deviation from straight-line resolution.
    **RECORD this number with the label: RES

14. [DLY] will appear in the display window, then -

15. [CHN1] will appear in the display window, then -
    a number indicating the sensor test for Channel 1.
    **RECORD this number with the label: CHN1.

16. Push in and hold the external button until [PLUG IN DSM PUSH] appears in the display window, then -

17. Insert a new DSM in the DP115.
    **RECORD the DSM number with the label: DSM#IN
    Note: **If either test fails, remove a battery, replace the DSM with another one and start the procedure again from "Power Up".**

23. If both tests pass:
    **RECORD the time of day with the label: Start Time.
    **RECORD the staff gage height with the label: Staff Gage (ft).

24. [RUN] should then be displayed in the display window.
    **RECORD RUN with the label: DISPLAY

25. Replace the face plate on the case and tighten the 4 screws.

The DSM containing data is read with an Omnidata Model 217 Reader. The DSM Reader transmits the data from the DSM to a computer file where it can be further reduced to a stream stage record.

DP115 DATAPOD SPECIFICATIONS

FUNCTION:
Single channel stream stage recorder.

TYPE OF SENSORS:
10-turn potentiometer. 5,000 to 100,000 Ohm resistance.

RESOLUTION:
0.01 foot in 10 feet of water.

RECORDING FUNCTIONS:
Records time of change and amount of change in water level.

SAMPLING INTERVALS:
User sets the time of day.

INPUT CONNECTOR:
3-pin environmentally sealed.

DATA STORAGE:
Medium: Non-volatile, interchangeable memory module.
Retrieval: Via built-in display or Model 217 Reader.

OPERATING CONTROLS AND DISPLAY:
Display: 4 1/2 digit LCD with low battery indicator.
Push Button: control data display and retrieval.

CLOCK ACCURACY:
+- 3 minutes per month (-10C to + 60C).

SELF TEST:
Performs self test functions on power-up.

OPERATING ENVIRONMENT:
-35 deg C to + 60 deg C, 0 to 100% RH, dust and water tight.

POWER:
8 alkaline AA penlight cells..

SIZE AND WEIGHT:
6.3" x 3.3" x 2.3", 1.2 lb.

APPENDIX A-6.3

Data Logger Equipment
Specifications and Procedures

Data Logger/Bubbler System Procedures

Four Campbell Scientific CR-10 data logger/bubbler systems were put into operation at RMA during WY89. The CR-10 data logger/bubbler system provides stream stage data throughout the year including periods of freezing conditions.

Customized software was developed to operate the data logger and associated bubbler system. The data logger/bubbler system software controls several functions:

- operating the system on a specified uniform time interval;
- performing the calibration calculations; and
- storing the data in the RAM pack storage module.

This software can be loaded either by the use of the hand-held display or by transferring the program from a PC compatible computer to the unit's RAM pack storage module, then down loading the program from the RAM pack into the data logger. The time interval between the start of each measurement cycle is user-selectable and may range from 20 seconds to 6554 seconds. The measurement cycle interval used during WY89 was 900 seconds (15 minutes). Calibration of the data logger/bubbler system is based on two different pressure measurements made at a known distance apart in a reference cylinder located in each station's gage house. The software residing in the data logger performs the calibration calculation prior to each measurement cycle. During the routine monthly maintenance, the calibration is checked using the station's staff gage reading as a reference point, so that the accuracy of each measurement can be verified.

Data are retrieved from the from the RAM pack storage module using either SMCOM or PC208 software. Both SMCOM and PC208 are available from Campbell Scientific, Inc. These communication software programs run on PC compatible computers, additionally, the PC208 software also serves as a simple data formatting and programming tool for the data logger.

Various field operating procedures were used during WY89 for proper and continual operation of CR-10 data logger/bubbler system stations. They are as follows:

1. <u>Reading and Recording the Current Datalogger Output</u>

This procedure is performed during each weekly station visit. Each CR-10 is equipped with a hand help keypad and display. The following key entries denote specific display readouts. Output from the keypad's display is recorded in the field log book and a data sheet that is kept in the gage house. Additionally, nitrogen tank pressure, staff gage reading, and flow condition are recorded in the log book and data sheet.

- *5 - (Real Time)
  A - The Current Year
  A - The Julian Day
  A - The Time - Mountain Standard

- *6 - (Field Data)
  A
  #1 - Head above tube in stream.
  A
  #2 - Depth in reference tube above top line.
  A
  #3 - Ambient Temp. - °C
  A
  #4 - Reference differential - distance between lines in reference tube - (approx. 1 ft - 1.0).
  A
  #5 - Battery voltage - should be above 12 v.
  A
  #6 (with Isco sampler), 0.01 = sample taken, 0.00 = no sample.
  #20 and #21 - Time sample(s) taken.
    #20 - XXXX divide by 24 and add 1 = (day sample taken).
    #21 - minutes + #20 = (actual time sample taken).

2. Changing Batteries

The CR-10 data logger/bubbler system is powered by an industrial 12-volt, 15 amp-hour, sealed lead-acid battery. When the voltage falls below 12 volts, the battery is changed. The battery could be damaged if it is left in the field when the voltage drops below 12 volts. This is especially critical in the cold winter months.

The CR-10 has an internal battery pack consisting of eight alkaline D-cell batteries, that can be used as a back-up for the primary power supply. The following procedure is used to keep power applied to the unit while the external battery is being changed:

1. Insert the one D-cell battery back into the internal battery pack.
2. Disconnect the leads from the discharged external battery.
3. Connect a charged external battery.
4. Remove the D-cell battery from the internal battery pack.

3. Changing Nitrogen Tanks

Industrial nitrogen is supplied to the bubbler from a standard 2,200 psi nitrogen tank. The tank is equipped with a low pressure regulator to maintain a constant flow of 9 psi to the bubbler. The pressure to the bubbler can be changed by using the T-handle on the regulator. The regulator also has a gauge that indicates the pressure of nitrogen in the tank. When the tank pressure drops to approximately 500 psi, it is replaced with a full one. The following procedure is used to change the nitrogen tank:

1. With hand-held display, check *5 mode time to be sure that the instrument is not about to sample.
2. Close the valve on the top of the nitrogen tank.
3. With a 7/8" wrench, unscrew the flare nut on the regulator from the nitrogen tank orifice.
4. Unhook the safety chain and remove the empty tank from the shelter.
5. Place a full tank in the shelter and fasten the safety chain around it.
6. Place the regulator on the full tank and tighten the flare nut.

   Note: Slightly wiggling the regulator while tightening the flare nut will help ensure a tight fit to the mating fitting on tank.
7. Open the valve at the top of the bottle. The pressure to the bubbler should read 9 psi.
8. Check for leaks around the regulator flare nut and tank orifice. After the regulator is attached to the new tank, open the T-handle until 0 psi is read on low pressure gage. Observe the tank pressure gauge to determine if any pressure is lost (15 minutes should be adequate). If the pressure drops, there is a leak in the connection. If a leak is detected, close the valve on top of the tank and remove the regulator. Place the regulator in a different position on the orifice and retighten the flare nut. Repeat the procedure to check for leaks.

SPECIFICATIONS

The following electrical specifications are valid for an ambient temperature range of -25 °C to +50 °C unless otherwise specified.

ANALOG INPUTS

NUMBER OF CHANNELS: 12 single ended or 6 differential with any combination, software selectable.

CHANNEL EXPANSION: Increments of 32 channels multiplexed through a single CR10 channel with the Model AM32 Relay Scanner. Maximum of 6 AM32's possible.

ACCURACY OF VOLTAGE MEASUREMENTS AND ANALOG OUTPUT VOLTAGES: 0.2% of FSR, 0.1% of FSR (0 to 40 °C).

RANGE AND RESOLUTION: Ranges are software selectable for any channel. Resolution for single ended measurements is twice the value shown.

Full Scale Range	Resolution
±2.50 volts	333. microvolts
±0.25 volts	33.3 microvolts
±25.0 millivolts	3.33 microvolts
± 7.5 millivolts	1.00 microvolts
± 2.5 millivolts	0.33 microvolts

INPUT SAMPLE RATES: The fast or slow A/D conversion on the four lowest input ranges uses a 250 us or 2.72 ms signal integration time, respectively. Two integrations, separated in time by ½ of an AC line cycle, are used with the 60 Hz or 50 Hz noise rejection option. Differential measurements include a second sampling with reversed input polarity to reduce thermal offset and common mode errors. Input sample rates are the time required to measure and convert the result to engineering units.

Fast single ended voltage:	2.6 ms
Fast differential voltage:	4.2 ms
Slow single ended voltage:	5.1 ms
Slow differential voltage:	9.2 ms
Diff. w/60 Hz rejection:	25.9 ms
Fast diff. thermocouple:	8.6 ms

INPUT NOISE VOLTAGE:

Fast differential	– 0.82 microvolts RMS
Slow differential	– 0.25 microvolts RMS
Diff. w/60 Hz rejection	– 0.18 microvolts RMS

COMMON MODE RANGE: ±2.5 volts.

DC COMMON MODE REJECTION: >140 dB.

NORMAL MODE REJECTION: 70 dB (60 Hz with slow differential measurement).

INPUT CURRENT: 3 nanoamps max.

INPUT RESISTANCE: 200 gigohms.

EXCITATION OUTPUTS

DESCRIPTION: The CR10 has 3 switched excitations, active only during measurement, with only one output active at any time. The off state is high impedance.

RANGE: ±2.5 volts.

RESOLUTION: 0.67 millivolts.

ACCURACY: Same as voltage input.

OUTPUT CURRENT: 20 mA @ ± 2.5 V, 35 mA @ ± 2.0 V, 50 mA @ ± 1.5 V.

FREQUENCY SWEEP FUNCTION: A swept frequency square wave output between 0 and 2.5 volts is provided for vibrating wire transducers. Timing and frequency range are specified by the instruction.

PERIOD AVERAGING MEASUREMENTS

DEFINITION: The time period for a specified number of cycles of an input frequency is measured, then divided by the number of cycles to obtain the average period of a single cycle.

INPUTS: Any single ended analog channel; signal dividing or AC coupling is normally required.

INPUT FREQUENCY RANGE:

Range Code	Preamp Gain	Input Hysteresis	Maximum Frequency
4	1	10 mV	200 kHz
3	10	1 mV	50 kHz
2	33	300 uV	20 kHz
1	100	100 uV	8 kHz

REFERENCE ACCURACY: ±40 ppm.

RESOLUTION: ±100 nanoseconds divided by the number of cycles measured. Resolution is reduced by signal noise and for signals with a slow transition through the zero voltage threshold.

TIME REQUIRED FOR MEASUREMENT: Signal period times the number of cycles measured plus 1.5 cycles; minimum measurement time is 2 ms.

RESISTANCE AND CONDUCTIVITY MEASUREMENTS

ACCURACY: 0.015% of full scale bridge output, limited by the matching bridge resistors. The excitation voltage should be programmed so the bridge output matches the full scale input voltage range.

MEASUREMENT TYPES: 6 wire and 4 wire full bridge; 4 wire, 3 wire, and 2 wire half bridge. Bridge measurements are ratiometric and dual polarity to eliminate thermal emf's. AC resistance measurements use a dual polarity 750 us excitation pulse for ionic depolarization, with the signal integration occurring over the last 250 us.

PULSE COUNTERS

NUMBER OF PULSE COUNTER CHANNELS: 2 eight bit or 1 sixteen bit selectable.

MAXIMUM COUNT RATE: 2000 Hz, eight bit counters; 250 kHz, sixteen bit counters. Pulse counter channels scanned at 8 Hz.

MODES: Switch closure, high frequency pulse, and low level AC.

SWITCH CLOSURE MODE

Minimum Switch Closed Time: 5 ms.
Minimum Switch Open Time: 6 ms.
Maximum Bounce Time: 1 ms open without count.

HIGH FREQUENCY PULSE MODE

Minimum Pulse Width: 2 us.
Maximum Input Frequency: 250 kHz.
Voltage Thresholds: Count upon transition from below 1.5 V to above 3.5 V.
Maximum Input Voltage: ±20 V.

LOW LEVEL AC MODE

(Typical of magnetic pulse flow sensors, selected anemometers, etc.)

Min AC Input Voltage: 6 mV RMS
Input Hysteresis: 11 mV.
Max. AC Input Voltage: 20 V RMS

Frequency Range:

AC Input (RMS)	Range
20 millivolts	1 Hz to 100 Hz
50 millivolts	0.5 Hz to 400 Hz
150 millivolts to 20 V	0.3 Hz to 1000 Hz

(Consult factory if higher frequencies are desired.)

DIGITAL I/O PORTS

8 ports, software selectable as binary inputs or control outputs.

OUTPUT VOLTAGES (no load): high – 5 V ± 0.1 V; low – < 0.1 V.

OUTPUT RESISTANCE: 500 ohms.

INPUT STATE: high – > 3 V; low – < 0.8 V.

INPUT RESISTANCE: 100 kohms.

TRANSIENT PROTECTION

All input and output connections to the CR10 module are protected using RC filters or transzorbs connected to a heavy copper bar between the circuit card and the case. The CR10WP Wiring Panel includes additional spark gap and transzorb protection.

CPU AND INTERFACE

PROCESSOR: Hitachi 6303.

MEMORY: 32k ROM, 16k RAM expandable to 64k.

DISPLAY: 8 digit LCD (0.5" digits).

PERIPHERAL INTERFACE: 9 pin D-type connector for keyboard/display, storage module, cassette, modem, printer, and RS232 adapter. Baud rates selectable at 300, 1200, 9600, and 76,800.

CLOCK ACCURACY: ±1 minute per month.

MAXIMUM PROGRAM EXECUTION RATE: System tasks initiated in sync with real-time up to 64 Hz. One measurement with tape transfer is possible at this rate without interruption.

SYSTEM POWER REQUIREMENTS

VOLTAGE: 9.6 to 16 volts.

TYPICAL CURRENT DRAIN: 0.5 mA quiescent, 13 mA during processing, and 35 mA during analog measurement.

BATTERIES: 7.5 Ahr alkaline D-cells or 5 Ahr rechargeable lead acid batteries, standard

PHYSICAL SPECIFICATIONS

SIZE: 7.8" x 3.5" x 1.5"; 9" x 3.5" x 2.9" with CR10WP Wiring Panel. Input connectors extend length 0.15".

WEIGHT: 2 lbs.

WARRANTY

Two years against defects in materials and workmanship.

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